THE BULLETIN
OF THE
AMERICAN CERAMIC SOCIETY

A MONTHLY PUBLICATION DEVOTED
TO THE PROMOTION OF CERAMIC
EDUCATION AND TECHNOLOGY

DECEMBER • 1933

VOLUME 12 NUMBER 12

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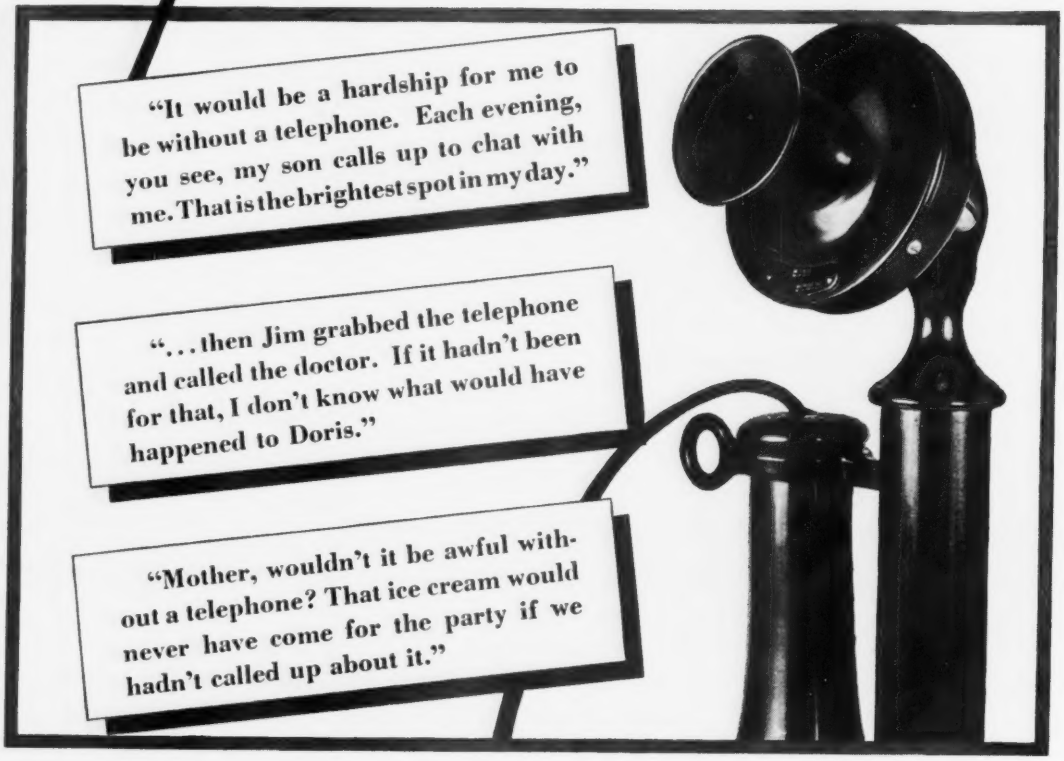
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A Monthly Publication Devoted to Proceedings
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of Technical, Scientific, and Art Questions, and
Promotion of Coöperative Research

Vol. 12 December, 1933 No. 12

EDITORIALS

INDEX REVIEW OF 1933

ADVANCEMENT IN CERAMIC ARTS AND SCIENCE

For the Society the year 1933 is history. The indexes for the *Journal* and *Ceramic Abstracts* are issued. They represent the very patient, time-consuming, and expert work of Miss Emily Van Schoick. One who has never made an index can not realize the time, thought, and skill involved in making an index most accurate, complete, concise, and easily workable.

The volume, detail, accuracy, and form of the indexes for the *Journal* and *Ceramic Abstracts* are not the essential reasons why the members may be proud and appreciative; the 1933 advances in ceramic art, science, and technology as revealed in these indexes make them of great value and are the cause for immense pride in their possession.

The dictionary and the encyclopedia provide interesting reading. When all else fails to appeal, the dictionary or encyclopedia will entertain and inspire the mind no matter how weary and worried one may be. The range and rapid change in subject matter are enlivening.

And so are the indexes for the *Journal* and the *Ceramic Abstracts* when one is weary-minded and knows not where to turn for inspiration.

A measure of one's effort to be informed and to keep vocationally inspired is the frequency with which he turns to these indexes and to the *Abstracts* for general reading. With the habit acquired to so use the indexes and *Abstracts* one instinctively knows how and where to turn when specific information is desired.

To each member, the final 1933 services rendered by the American Ceramic Society are (1) index for Volume 16 of the *Journal*, (2) the index for Volume 12 of *Ceramic Abstracts*, and (3) the index for the first six months of *The Bulletin*.

They are the most concise and accurate references available to the additions made to ceramic information in 1933.

LOVE OF KNOWLEDGE REQUIRES HUMAN CONTACT

Knowledge is gained from personal studies of literature and by personal investigation. But knowledge thus acquired, if without love, is acquired without enthusiasm and is without much value. The reason why persons with less educational equipment are often more successful in their use of information is their enthusiasm engendered by personal contacts.

It requires human contacts to develop that love of knowledge which is essential to its successful use. For this reason societies are organized and meetings are held.

Inspirations—vital sparks—come from human contacts. These, backed by knowledge gained by reading and research, make for accomplishment.

CERAMIC EDUCATION

Not less chemistry or product studies but more knowledge of the physics and mathematics of the many and varied fundamental facts pertaining to ceramic-ware production would give a more thorough preparation for service as ceramic engineers and ceramic technologists.

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PAPERS AND DISCUSSIONS

EFFECT OF GRAIN SIZING ON SHRINKAGE AND POROSITY OF GEORGIA KAOLIN REFRACTORIES*

By F. H. Norton

ABSTRACT

The porosity of various mixtures of crushed grog was measured in a dry, packed condition. Porosities as low as 22% were obtained without discarding much of the product from the crusher. Low-porosity grog mixtures when fired gave both a low porosity and a low firing shrinkage.

I. Introduction

A considerable amount of experimental and theoretical work has been done in this country and abroad on the packing of various proportioned grains.[1] Much of it has been done on spheres, both theoretically and experimentally, as exemplified by the recent work of Westman. Others, Andreasen, Furnas, Litzow, and Rieke, have worked with splintered or partly rounded grains and have determined the percentage voids with various compositions. Of these workers, Rieke is the only one who has systematically determined the firing properties of the various clay-bonded grog mixtures.

A low porosity body with a minimum firing shrinkage is of vital importance in slag-resisting and glasshouse refractories. Obviously, given a substantially nonporous grog, the more of it that is packed into a given volume the more nearly the desired result is approached. In a plant it is not economical to make three fractionings of the grog, each of a grain size known to give the minimum voids. This investigation, therefore, is a study of the properties of grog mixtures which are representative of a large proportion of a crusher material.

II. Experimental

A crushed grog of highly fired Georgia kaolin was screened into a number of sizes and a weighed quantity of each was placed separately into a small cylinder and jarred by hand to minimum volume. This volume then gave a measure of the per cent voids between the grains. Figure 1 shows a curve of void volumes for various sizes.

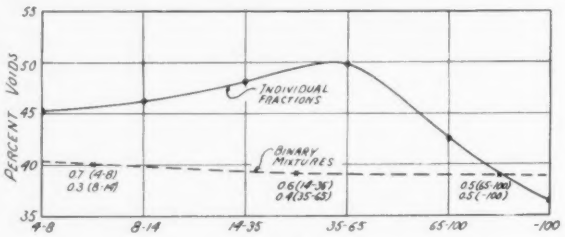

FIG. 1.

In order to make up practical mixtures of various grog sizes, the two coarsest fractions, the two medium fractions, and the two finest were put together. The voids for these combinations are also shown in Fig. 1.

The results of blending these binary mixtures are shown in Fig. 2. The densest mixture consists of 0.5 coarse, 0.1 medium, and 0.4 fine and gives a per cent void of 22.

NOTE: This is considerably lower than that obtained by most of the experimenters quoted with the exception of Westman who obtained even smaller values by using larger ratios between the grog fractions.

* Presented at the Annual Meeting, AMERICAN CERAMIC SOCIETY, Pittsburgh, Pa., February, 1933 (Refractories Division). Received February 23, 1933.

[1] (*a*) A. H. M. Andreasen, "On the Relation between Gradation of Grains and Interspace in Products of Loose Grains," Royal Technical College of Copenhagen, *Kolloid-Z.*, **50,** 217–28 (1930).

(*b*) E. Cramer, "Manufacture of Dense Grog Bodies," *Tonind.-Ztg.*, No. 43, pp. 623–27 (1899).

(*c*) Fuller and Thompson, *Proc. Amer. Soc. Civil Eng.*, **33,** 261 (1907).

(*d*) C. C. Furnas, "Relations between Specific Volume Voids and Size Composition in Systems of Broken Solids," Bur. Mines, *Rept.* No. 2894.

(*e*) Groothoff, "Consolidated Particles with Particular Consideration of the Structure Question," *Ber. deut. keram. Ges.*, **9,** 421–45 (1928).

(*f*) K. Litzow, "Condition of Grog Particles for Dense Refractory Materials," *Tonind.-Ztg.*, No. 49, p. 709 (1931).

(*g*) R. Rieke and J. Gieth, "Study of Necessary Grain-Size Composition of Grog to Develop a Maximum Density in Grog Brick," *Ber. deut. keram. Ges.*, **11** [7], 394–406 (1930).

(*h*) V. Skola, "The Sizes of Grains in Ceramic Bodies," *Feuerfest*, **6,** 81–85 (1930).

(*i*) S. M. Swain and S. M. Phelps, "Proportioning Grain Size in Clay Refractories," *Jour. Amer. Ceram. Soc.*, **14** [12], 884 (1931).

(*j*) A. E. R. Westman and H. R. Hugill, "The Packing of Particles," *ibid.*, **13** [10], 767–79 (1930).

III. Practical Applications

Screen analyses of four dense kaolin grogs are given in Table I.

TABLE I

	A	B	C	D
4–8	35	42	22	15
8–14	15	18	11	31
14–35	6	6	20	32
35–65	4	4	13	11
65–100	20	15	17	6
−100	20	15	17	4
Per cent voids	22.0	25.6	25.6	30.0

Batches of B mix so prepared as to prevent segregation were mixed with raw Georgia kaolin

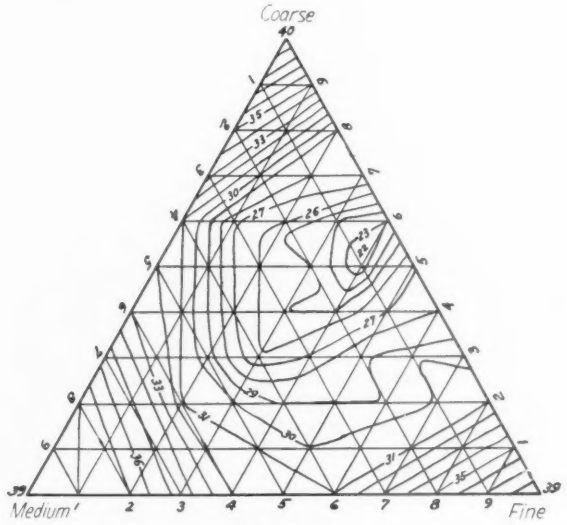

FIG. 2.

and fired to 3000°F for two hours. Figure 3 shows the fired shrinkage and porosity of these mixtures with various amounts of bond clay. The minimum porosity of 6.2% comes at a clay content of 17%, which corresponds to about 24% of clay by volume and which is very close to the actual voids between the grog.

In Fig. 4 is shown the effect of firing temperature on the samples made up with the preceding type of grog and 15% clay.

The total amount of shrinkage is not so important as is the slope of the shrinkage curve at the firing temperature, for this determines the

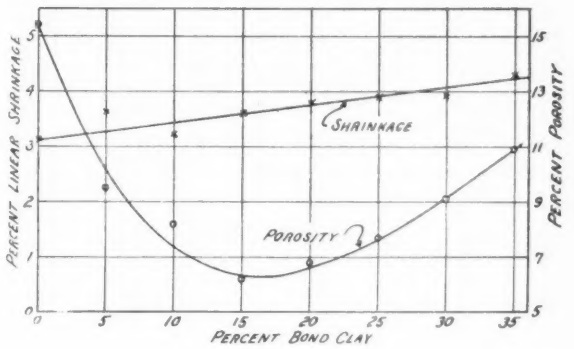

FIG. 3.

tendency to shrink in service if used higher than the firing temperature.

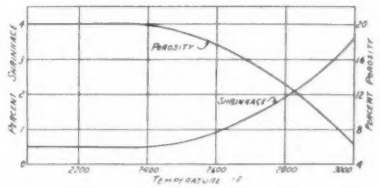

FIG. 4

IV. Conclusions

By plant methods it is possible to produce grog mixtures having voids as low as 25%, and by careful screening, as low as 22%. Such grog mixtures, with just sufficient clay to fill the voids, give both a low porosity and a low shrinkage on firing.

Acknowledgments The careful work of V. J. Duplin, Jr., and E. F. Bennett, Babcock & Wilcox Fellows, on this investigation is gratefully acknowledged.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS

DE-AIRING OF CLAY AS APPLIED TO THE STIFF-MUD PROCESS*

By W. Wurth Kriegel

I. Introduction

As a result of the experiments conducted by Brand, Lapp, Staley, Lovejoy, Brown, and others, it has been more or less definitely proved that many of the difficulties encountered in extruding clays through a die are caused or at least are aggravated by air entrapped in the clay during processing. The air forms in pockets and blebs throughout the clay mass, follows in the wake of the pug-mill knives, collects behind the die bridges, and thus destroys the continuity of the clay mass. This entrapped air makes itself evident in the extruded clay column as laminae of structure (both die and auger lamination), blisters on the surface of the column, feather-edging at the corners, and general shortness of the clay with overpugging. As a corrective to these conditions, de-airing or evacuation of the pugged clay has been devised.

II. History

Although evacuation of stiff-mud bodies has been adopted only recently by the industry, it is not a new process. In 1902, H. F. Staley was granted a patent for a process of clay evacuation. This patent was allowed to expire in 1919 without further development. The Chambers Brothers Company of Philadelphia has recently been building commercial machines under a subsequent patent granted to Staley in 1923. J. J. F. Brand was granted a patent prior to Staley's later patent. The process has been used by the Buckeye Clay Pot Company for several years in the manufacture of tank blocks. Additional work by Lovejoy and CoVan, Brown, Straight, and Everhart, Austin, and Rueckel has materially developed the process.

Editor's Note: The J. C. Steele & Sons Company has a de-airing equipment and the Stevenson Company has apparatus for de-airing clay for sewer-pipe manufacture.

III. Essentials of the Process

The essential elements of vacuum treatment are as follows: (1) a means of pugging or tempering the clay; (2) a chamber wherein the air may be removed; (3) a means of moving the clay into and out of this chamber and through a forming die; (4) a means of sealing this chamber effectively; (5) a means of disintegrating the pugged clay while in this chamber; and (6) some variety of a vacuum pump. Pugging the clay is done by the wet-pan, pug mill, or combined pug-mill and auger machine, usually one of the latter two machines because of the continuity of flow through them.

The vacuum chamber itself is merely an inclosed chamber under reduced pressure having inlet and outlet ports for the tempered clay. The size of the chamber ranges from 2 to 60 cubic feet, depending upon the capacity of the machine and the difficulty encountered in de-airing that particular clay. The vacuum chamber usually contains a disintegrating device. Suitable inspection plates, windows, clean-out doors, etc., should be provided. The pugged clay is forced into the chamber through a constricted opening by means of some propelling device such as an auger which causes the clay to be compacted. The clay itself thus forms the seal at the entry port to the chamber. When the chamber is so constructed that the clay travels horizontally, it is propelled through the chamber either by pug-mill knives or auger blades. In those chambers where the clay drops to a lower level, it is carried by an auger after having fallen by gravity to the floor of the chamber. In all cases, the clay is forced by an auger into the forming die.

IV. Sealing of the Vacuum Chamber

To maintain a workable "vacuum" of from 25 to 29 inches of mercury within the vacuum chamber, it is necessary to seal all joints, ports, and covers of the chamber. In all of the commercial units that have come to the attention of the writer, the clay entrance and exit ports to the chamber are sealed by the clay itself, compacted into a solid column. The clay entering the chamber is forced through an opening of the restricted area. This may be a tapered opening or, as in the case of the Staley patent which was assigned to the Chambers Brothers Company, may be a perforated plate with circular or semi-circular holes through which the clay is forced.

* Presented at a meeting of the Pacific-Northwest Section of the American Ceramic Society. Received July 15, 1933.

The extruded column of clay from the die forms the exit port seal. Machined joints may be effectively sealed by the use of shellac and paper gaskets while the removable inspection plates, clean-out doors, etc., may be best sealed by soft rubber gaskets. Special stuffing boxes are needed where auger shafts pass out of the vacuum chamber.

(1) Clay Must Be in Small Particles That the air may be effectively removed from the pugged clay, it is necessary that the compacted clay column entering the vacuum chamber be reduced to small particles. The size of these pieces will depend entirely on the characteristics of the clay, such as its fineness, its plasticity, and whether or not gases are liberated in the hydrolysis of the clay by the pugging water. This disintegration may be accomplished by forcing the clay through a stationary grid or perforated plate by some mechanical shredding device. Of the former method, the Chambers Brothers Company's machine, having the perforated plate seal through which the clay is forced "in a plurality of separated streams" and cut off on the inner face of the plate by a rotating knife, is the outstanding example. Many of the units installed on the Pacific Coast utilize a patented grid (controlled by the Gladding, McBean & Company) by which the clay column is cut. The machine manufactured by the Bonnot Company utilizes a mechanical disintegrator. A type of mechanical disintegration used in several Pacific Coast installations consists of a sealed pug-mill chamber, the knives of which serve both to cut and shred the clay as well as to convey it through the chamber. This type has been found to be satisfactory in treating those clays from which the occluded gases are difficult to remove.

V. Vacuum Pump

The last element of the process is the vacuum pump. The rotary type of pump has found favor with the eastern manufacturers of vacuum units. It is an integral part of the Bonnot machine and a small machine now being developed by the Chambers Brothers Company. The single-cylinder, vertical, double-action vacuum pump, such as type 15 of the Ingersoll-Rand Company, has found considerable favor on the Pacific Coast. The inclusion of a "barometric leg" between the vacuum chamber and pump is recommended. This barometric leg consists of an inverted "U" made of pipe and rising to a height equal to the height of a column of water that the vacuum obtained would support. Numerically, this height in feet is equal to 1.13 multiplied by the degree of vacuum expressed in inches of mercury. The purpose of the barometric leg is to prevent water, moisture, and dirt from being carried over into the pump, which would dilute the oil in the crank case and otherwise impair the efficiency of the pump. An air compressor has been used as a vacuum pump by connecting the vacuum chamber to the intake port of the compressor but it is not recommended for other than preliminary experimental work as the compressors do not have the cubical displacement to give a satisfactory operating efficiency. The degree of evacuation commonly obtained is from 26 to 29 inches of mercury. In an extensive series of experiments, however, at the Ohio State University Engineering Experiment Station it was found that an optimum in the properties for the evacuated clay occurred around 25 to $27\frac{1}{2}$ inches of mercury. They attribute the impairment of these properties at higher evacuation to an increase in the rate of evaporation.

VI. Installations

Since the essential component parts of the process have been discussed, it is interesting to see how the machine manufacturer and the individual clay products manufacturer have assembled these parts into a complete working unit.

(1) Chambers Brothers Company This Company, working on the authority of the Staley patent, has developed an auxiliary chamber to be used either in a regular auger machine or in a combined auger and pug mill. This chamber is "placed in line with and between the machine barrel and auger case." The feeding position of the auger machine is not moved, but the die end of the machine is moved forward from one to two and one-half feet. The perforated plate described above which serves both as a seal and a disintegrator is placed at the entrance to this chamber. The chamber is evacuated with a rotary vacuum pump. The installation requires a new auger shaft as well as new expressing equipment to move the clay into and out of the de-airing chamber.

(2) Bonnot Company This Company has developed and placed on the market a complete self-contained unit for the manufacture of clay products under vacuum. It has the appearance of a large combined machine but contains a pugging chamber, a mechanical disintegrating device, vacuum chamber, expressing auger and die, and vacuum pump, all driven by a single motor mounted on top of the machine. This unit has given excellent results in the eastern districts but none is known on the Pacific Coast.

(3) Pacific Coast Installations On the Pacific Coast, most of the de-airing units have been developed by Davis Brown of Los Angeles. In all cases they have been constructed of local parts. The eight installations in Washington and California are of two types.

In the first type, which is first both in simplicity and developmental stage, a combined machine discharges through a constricted nozzle and patented grid into the side of a feed hopper of an auger machine. The top of this hopper casting is machined and fitted with a rubber gasket cover through which the vacuum-pump connection is made. This forms the vacuum chamber. A special type of packing gland is constructed to fit around the auger shaft. This unit has served effectively on many clays but it was found to be wholly inadequate for other clays in California and Washington.

It was decided that this installation had too small a vacuum chamber, that the time of vacuum treatment was too short, that the clay was not sufficiently cut and disintegrated while in the vacuum chamber, and that possibly the gases were being evolved by the hydrolysis of the clay after the clay had passed on into the auger barrel. To correct these troubles, a pug mill was inserted between the combined machine and the extrusion auger machine. A sealed cylinder with a removable cover was substituted for the pug-mill body. Suitable connections, packing glands, cover plates, and inspection windows were made to facilitate and insure the perfect operation of the unit. The clay was discharged from the combined machine through the nozzle and grid as before. The vacuum chamber now contains some 60 cubic feet volume as compared with 2 cubic feet, while the clay is cut by 10 feet of pug-mill knives and is subjected to the reduced pressure for several additional minutes. This processing permits the most difficult clays to be worked.

VII. What May Be Expected from the Vacuum Process

While the vacuum process is not offered as a "cure-all" for the ills of the stiff-mud process it does have many advantages. De-airing greatly increases the green strength and plasticity of the short clays. It permits the use of more intricate dies as well as of clays that would not otherwise be workable and improves those clays now workable. It eliminates visible lamination and blistering of the column. It increases dry strength and thus reduces drier loss. It increases fired strength, lowers absorption, and permits firing at slightly lower temperatures. It improves the appearance of all the ware, but it also increases unit weight because of increased density. This may be nullified by the increased strength. It has no effect on fired color at any particular temperature or set of conditions.

Acknowledgments The writer wishes to express his acknowledgment and appreciation to W. E. Lemley of Gladding, McBean & Company, to Hewitt Wilson of the University of Washington, and to J. H. Chambers of the Chambers Brothers Company.

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(9) G. W. Lapp, U. S. Patent, No. 1,561,002.

(10) H. F. Staley, U. S. Patent, No. 1,478,842.

ACTIVITIES OF THE SOCIETY

Officers of the Industrial Divisions

L. E. Barringer E. deF. Curtis	Art	George H. Brown C. H. Peddrick, Jr.	Materials and Equipment	J. O. Everhart W. C. Rueckel	Structural Clay Products
A. I. Andrews W. N. Harrison	Enamel	R. A. Heindl R. B. Sosman	Refractories	R. F. Grady, Jr. H. E. Davis	Terra Cotta
H. H. Blau S. R. Scholes	Glass			Louis Navias R. F. Geller	White Wares

PRESIDENT J. C. HOSTETTER ELECTED HONORARY PRESIDENT OF THE INTERNATIONAL CONGRESS OF GLASS AND CERAMICS

Honor was paid to the American Ceramic Society in the appointment of J. C. Hostetter, President of this Society, as one of the honorary presidents of the International Congress. The American Ceramic Society appreciates this recognition and regards it as a great honor.

We trust that when conditions permit, consideration will be given to the selection of the United States as a meeting place for a similar International Congress in the future.

HONORABLE RECOGNITION OF PAST-PRESIDENT EMERSON P. POSTE

The November issue of the *Rotarian* carries a large half-tone of our past-president with this caption:

We recognize Emerson P. Poste, chemical engineer, because he has just completed a successful year as President of the American Ceramic Society, because he has given freely of his time, thought, and enthusiasm to community interests, and because he is serving his third term as Secretary of the Chattanooga, Tennessee, Rotary Club.

Only eight each month, ninety-six each year, out of the hundreds of thousands of Rotarians the world over receive this honorable recognition, which makes this honoring of our past-president of special interest to members of this Society.

1934 PUBLICATIONS

The Bulletin in its new format began with Volume 12, Number 7, July, 1933. Index and title-page for the first six numbers of Volume 12 (old format) appeared with the December issue of the *Journal* and *Abstracts*. The index for the second six issues of *The Bulletin*, Volume 12, will appear next December, thus permitting the binding of one and one-half years of *The Bulletin* in one volume.

Beginning with the January issues, Volume 17 of the *Journal* and Volume 13 of *Ceramic Abstracts* will be in the same format as *The Bulletin*.

This change in size, with all of its attendant confusion—the format of a $7^3/_4$- by $10^5/_8$-inch page with 3- by $8^5/_8$-inch type columns—has not been adopted merely for the sake of change or to conform to the standard format which has been adopted by several technical societies. The essential reasons, as set forth in the July, 1933, issue of *The Bulletin*, are economy and convenience for the Society and for the members. The three-inch wide columns permit reading with a minimum of eye fatigue and make the use of illustrations more economical. The expense of type "run around" can, with the three-inch column, be used for providing larger cuts.

Then, too, the books when bound will be less thick and will utilize more of the height and breadth and less of the length of bookshelves.

EXAMPLES OF THE MANY CONGRATULATIONS ON THE PHASE-RULE COMPILATION BY HALL AND INSLEY

I wish to congratulate the Publications Committee for the excellent job that has been done on the October issue. This will be a very useful reference for all who work in the field of high temperature chemistry. Order for seventeen copies inclosed.

Nelson W. Taylor, *Head, Department of Ceramics*, Pennsylvania State College.

The article, "A Compilation of Phase-Rule Diagrams of Interest to the Ceramist and Silicate Technologist," comprising the October number of the *Journal of the American Ceramic Society*, has proved to be of great interest to the members of our laboratory staff, who have requested extra copies. We should therefore greatly appreciate receiving from you twelve reprints of the article, or, if that many can not be spared, as many as you can send us.

Catherine G. Deneen, *Laboratory Library*, Corning Glass Works.

This compilation of Phase-Rule diagrams by Hall and Insley is certainly a fine contribution to phase-rule literature.

Wesley G. France, *Professor of Colloid and Electrochemistry*, Ohio State University.

You are to be congratulated on the October issue of the *Journal* containing the Phase-Rule diagrams. I believe this is one of the most important publications the Society has issued because it makes easily available information which was difficult to find from the general literature.

Robert J. Montgomery, Associate Professor of Ceramics, University of Toronto.

Copies of this valuable compilation are being sold in lots to manufacturing companies and to schools at $1.00 per copy.

PROPOSED BY-LAWS OF THE WHITE WARES DIVISION

Article I

Membership

(*a*) Members of this Division shall be members of the American Ceramic Society and must have declared their major interest to lie within the field covered by this Division. All members will be privileged to vote in the Division.

(*b*) This shall not be construed as to prevent members of the American Ceramic Society having their main interest in other divisions from attending the meetings and taking part in the discussion of the White Wares Division.

Article II

Dues

The members of the White Wares Division shall not be required to pay dues in addition to the regular dues of the American Ceramic Society.

Article III

Officers

(*a*) The officers of the White Wares Division shall consist of a Chairman and a Secretary-Treasurer. They shall each serve one year and take office at the last session of the Annual Meeting at which they are elected.

(*b*) The duties of the Chairman shall be to appoint the various chairmen of the divisional standing committees together with a member to the Editorial Committee and two councillors, as listed in Article V, and to have general supervision of the officers of the Division.

The Chairman shall also appoint a member to the Management Committee of the Society. (Article VI.)

(*c*) The Secretary shall perform the duties of the chairman in his absence. The Secretary shall also be responsible for keeping minutes of all Division meetings, a full record of the correspondence of the Division, and such other duties as may be assigned to him by the Chairman.

Article IV

Nominations and Elections

(*a*) The Nominating Committee shall consist of a chairman and a member.

(*b*) The Nominating Committee shall be selected in the same manner as the Division Chairman and Secretary-Treasurer as described below. The Divisional nominating committee shall serve as members of the general nominating committee.

(*c*) It shall be the duty of the Nominating Committee to make two nominations each for the Chairman, Secretary-Treasurer, and Trustee of the Division, and two nominations each for the members of the Nominating Committee in the following manner:

(*d*) The selections from the list of active members of the Division shall be mailed to the Chairman by October 1 accompanied by their acceptance of such nomination in writing.

(*e*) Additional nominations may be made by petition signed by twenty active members of the White Wares Division, signed and sent to the Chairman of the Division before December 15. The nominee's acceptance must be sent in writing with the petition.

(*f*) The election of Trustee, officers, and members of the Nominating Committee shall be carried out by letter ballot as follows: The Chairman of the Division upon receipt of the Nominating Committee's report shall certify the names so submitted to the General Secretary of the American Ceramic Society, who shall then cause their names to be published in the November issue of *The Bulletin*.

(*g*) Not later than thirty days before the Annual Meeting the General Secretary shall mail each active voting member of the Division printed ballots containing the names so submitted.

(*h*) These ballots shall be enclosed in an envelope on which there shall be no marks of identification other than the word "ballot." This envelope shall be enclosed in another for mailing, upon the back of which the voter shall endorse his name. The marked ballots shall be sent directly to the Chairman of the Division.

(*i*) The balloting shall close at twelve o'clock noon on the day preceding the opening day of the Annual Meeting.

Article V

Standing Committees

(*a*) The Rules Committee shall consist of a chairman and two other members of his selection. The duties of the Rules Committee shall consist in revising and interpreting the By-Laws of the Division. The members shall serve for one year.

(*b*) The Editorial Committee shall consist of a chairman and two other members, one member being nominated each year for a period of three years. The senior member shall be chairman in his final year. The duties of the Editorial Committee shall consist of reading and passing on all papers issuing from, or of major interest to, the White Wares Division in accordance with the rules and instructions of the Publications Committee of the Society. Preprinted papers are also included.

(*c*) The Committee on Papers and Programs shall consist of a chairman and two other members of his selection. The duties of this Committee are to plan the program for the Annual Meeting. The members shall serve for one year.

(*d*) The Committee on Standards shall consist of a chairman and two other members of his selection. The duties of this Committee shall be to set up the following standards: (*a*) definitions, (*b*) tests, (*c*) products, and (*d*) materials. The members shall serve for one year.

(*e*) The Committee on Research shall consist of a chairman and eight members of his selection. Where possible, there shall be a member to represent each of the following main branches of work in the White Wares Division: (1) earthenware, (2) floor and wall tile, (3) vitrified tableware, (4) sanitary ware, (5) high tension electrical porcelain, (6) low tension electrical porcelain, (7) a representative of the White Wares Section of the Bureau of Standards, and (8) a representative of the ceramic schools.

The duties of the Committee shall be (1) to act as an advisory board to the White Wares Section of the Bureau of Standards; and (2) to act as an advisory group in the matter of ceramic research on whiteware problems to such ceramic schools as desire to coöperate with the Committee. The chairman shall serve for three years. The members shall serve for one year.

(*f*) The Committee on Data shall consist of a chairman and two other members of his selection. The duties of this Committee shall be to assemble available data concerning the whiteware industry. The members shall serve for one year.

(*g*) The Committee on education shall consist of a chairman and two other members of his selection. The duties of this Committee shall be to keep the White Wares Division informed of the educational policies in the ceramic schools. The members shall serve for one year.

(*h*) The Committee on Membership shall consist of a chairman and two other members of his selection. The duties of this Committee shall be to do what is necessary in increasing the membership of the Division. The members shall serve for one year.

(*i*) The Committee on Exhibitions shall consist of a chairman and two other members of his selection. The

duties of this Committee shall be the arrangements of the exhibits at the Annual Meeting. The members shall serve for one year.

(*j*) Councillors. The Division Chairman shall select for Councillors of the Division two members who have had experience in the affairs of the White Wares Division and in the affairs of the Society to whom he may turn for mature advice and judgment. The Councillors shall serve for one year.

(*k*) The Chairman of the Division shall have the authority to set up other committees as he thinks necessary to carry on the work of the Division.

(*l*) All members of the standing committees shall take up their duties at the last session of the Division at the Annual Meeting.

Article VI

(*a*) Trustee of the White Wares Division. Every three years the Division shall elect one of its active members to act on the Board of Trustees of the Society. (The next term shall start February, 1935.)

(*b*) Management Committee of the Society. The Chairman shall appoint one member of the White Wares Division to be its representative on the Committee concerned with the management of industrial ceramic organizations. The member shall serve for one year.

Article VII

Amendments

(*a*) Twenty members may petition the Chairman to call a vote on an amendment to the By-Laws.

(*b*) The Secretary shall submit ballots to the members at least sixty days before the Annual Meeting, and only such ballots returned to the Chairman prior to the Meeting shall be counted.

(*c*) The two-thirds majority shall be necessary to carry the amendment and a quorum of twenty-five active members of the Division shall be required.

PRESIDENT HOSTETTER HONORED GUEST AT SHEFFIELD

The First Ordinary General Meeting for the new session of the Society of Glass Technology was held in Sheffield on October 18, 1933. J. C. Hostetter, President of the American Ceramic Society, and Mrs. Hostetter were guests of the Society on this occasion.

On October 17 a dinner was held in honor of Dr. and Mrs. Hostetter at the King's Head Hotel, Sheffield. After the dinner Dr. Hostetter spoke on present conditions in the American glass industry.

ALEXANDER SILVERMAN DELEGATE TO INTERNATIONAL UNION OF CHEMISTRY

Dr. Silverman has accepted the appointment as official delegate of the American Ceramic Society to the International Union of Chemistry in Madrid, April 5 to 11, 1934, and expects to attend.

FREDERICK H. RHEAD NOMINATED BY ART DIVISION AS TRUSTEE MEMBER

The Nominating Committee of the Art Division has announced the nomination of Frederick H. Rhead to serve three years as a member of the Board of Trustees.

LOCAL SECTION NEWS

California Section*

After a year of total inactivity, an enthusiastic and interesting meeting of the California Section of the American Ceramic Society was held on October 16. Dinner was served to about fifty members.

Officers for the year are as follows: *Chairman*, A. Lee Bennett; *Vice-Chairman* (for Southern District), F. A. McCann; *Vice-Chairman* (for Northern District), Vernon Sullivan; *Secretary*, Thomas S. Curtis; *Treasurer*, Ralph Martin.

The program consisted of an address entitled "The N.R.A. in the Ceramic Industry," by Robert Linton, Vice-President and General Manager of the Pacific Clay Products Company, and a paper on "Masonry Construction in Relation to Earthquakes," by Mr. Wilder, Engineer of the Clay Products Institute. Mr. Wilder pointed out that the disastrous and wholesale failure of brick structures in the March 10, 1933, temblor could never have happened if buildings of masonry construction had been designed instead of merely built. The necessity for adequate reinforcement to withstand horizontal stresses equal to the gravitational load was made so clear that the layman could not fail to understand. The study given to this subject by Mr. Wilder and his associates, especially under the circumstances of abundant practical evidence so recently available, is worthy of wide-spread recognition on the part of the brick manufacturers, the general public, and the general contractor and builder.

The following resolution was offered by Robert Linton and was adopted unanimously:

WHEREAS, The manufacture of clay products is an important industry in Southern California and provides employment for a great many men, and

WHEREAS, A number of Federal buildings have been approved for construction in Southern California and requests have been made for Federal aid for the construction of other buildings and installation of sewers, and

WHEREAS, These projects will require considerable quantities of clay products and provide employment for men in plants that are now idle,

Therefore Be It Resolved, by the California Section of the American Ceramic Society, assembled on this date, that the Public Works Administrator be urged to take prompt action on these projects.

Pursuant to the resolution, the following telegram was sent to Secretary Ickes:

Hon. Harold L. Ickes,
Public Works Administrator,
Washington, D. C.

California Section American Ceramic Society, at meeting today passed resolution urging you to release funds for Federal buildings that have been approved for Southern California and further to take prompt action on building and sewer projects which have been submitted to Public Works Administration. Clay projects manufacture is an important industry in Southern California and the building and sewer projects will make use of large quantities of these materials and provide employment for men who are now out of work. Private building at a standstill and clay products plants therefore nearly or altogether idle.

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* T. S. Curtis, *Secretary*.

Baltimore-Washington Section*

A dinner meeting of the Baltimore-Washington Section of the American Ceramic Society was held Saturday, November 11, at Sholl's Café, Washington, D. C. The following papers were presented:

(1) Notes on Boulder Dam
By P. H. Bates, Chief of the Ceramic Division, Bureau of Standards

(2) Errors in Pyrometric Practice
By W. F. Roeser, Pyrometry Section, Bureau of Standards.

* C. Hahner, *Secretary*.

OFFICERS TO BE BALLOTTED ON FOR 1934

For President, W. Keith McAfee, *Standard Sanitary Manufacturing Company*, New Castle, Pa.

For Vice-President, J. M. McKinley, *North American Refractories Company*, Cleveland, Ohio, and Robert Twells, *A C Spark Plug Company*, Flint, Mich.

For Treasurer, H. B. Henderson, *Standard Pyrometric Cone Company*, Columbus, Ohio.

For Trustee, Art Division, F. H. Rhead, *Homer Laughlin China Company*, East Liverpool, Ohio.

For Trustee, Enamel Division, W. C. Lindemann, *Lindemann & Hoverson Company*, Milwaukee, Wis.

For Trustee, Refractories Division, R. B. Sosman, *United States Steel Corporation*, Kearny, N. J.

NEW MEMBERS RECEIVED IN NOVEMBER

CORPORATION

Newbold Silica Fire-Brick Co., Ltd., St. James Bldgs., 109 Elizabeth St., Sydney, Australia.

Sur Enamel & Stamping Works, Ltd., M. M. Sur (voter), 9 Middle Row, Entally, Calcutta, India.

PERSONAL

William T. Davies, Silvercrest Drive, Kenwood, Ohio; Sales Manager, Louisville Enamel Products Co.

Howard P. Eels, Jr., 845 Hanna Bldg., Cleveland, Ohio; President, Basic Dolomite, Inc.

Aage T. Krause, 3092 Broadway, Cleveland, Ohio; Librarian, Experimental Laboratory, Grasselli Chemical Co., Inc.

STUDENT

Everett C. Hite, Ohio State University.

New York State College of Ceramics

E. E. Beeton	**W. P. Kingsley**	**T. R. Ten Broeck**
R. C. Cibella	**W. W. Kuenn**	**Walter Tolbert**

University of Illinois

L. A. Lange	**R. S. Sheldon**	**A. E. Williams**

Membership Workers' Record

CORPORATION		STUDENT	
Thomas Campbell	1	C. R. Amberg	6
Office	1	R. K. Hursh	1
	–	A. J. Metzger	1
Total	2	C. W. Parmelee	2
PERSONAL		Total	10
Office	3	Grand Total	15

NECROLOGY

F. R. Clark

Word has been received of the death on May 31, 1933, of Frank Reynolds Clark of the Macbeth-Evans Glass Company. Mr. Clark was fatally injured in an automobile accident near Washington, Pa.

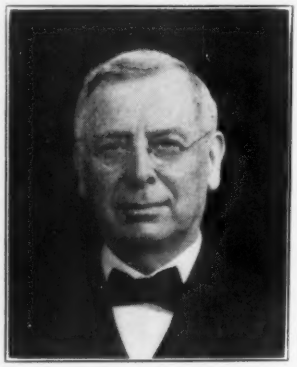
F. R. CLARK.

At the age of twenty-four Mr. Clark became Secretary and Treasurer of the Cincinnati Sand Blast Company which later became the Cincinnati Advertising Products Company. He was president and manager for many years. He was the inventor of the glass advertising globe which is used on all gasoline pumps throughout the country. In 1926 Mr. Clark sold this business. In 1932 he became associated with the Macbeth-Evans Glass Company, Charleroi, Pa., in charge of the globe division.

Mr. Clark had been a member of the American Ceramic Society for several years.

William T. Elkinton

William T. Elkinton, Chairman of the Board of the Philadelphia Quartz Company, died on October 25, 1933, in his seventy-third year. He was the third generation of his family in the business which celebrated its centenary in 1931 and the seventh generation of the Elkinton family in America.



WILLIAM T. ELKINTON.

Through more than 50 years of active business life, during which the Company expanded from a local enterprise to a business of national scope, William T. Elkinton consistently remembered his religious and philanthropic responsibilities. To use an expression taken from an old letter quoted in the Company's centenary booklet, he was concerned always "to dwell under a proper regard for the best things."

Naturally modest and retiring, he did many good works known only to those immediately concerned.

WIN WITH WISDOM

JOIN

THE AMERICAN CERAMIC SOCIETY

Another Message from Membership Committee

Sometimes we wonder if we are very wise. We appeal to the ceramic chemist, physicist, engineer, and executive, and we would not for a minute exclude any of these from our list to be solicited for membership in the American Ceramic Society, but how about the large number of operating men working in all kinds of plants, manufacturing ceramic products in all parts of the United States, who are not members of any society and yet most surely would benefit by the information to be secured from the American Ceramic Society.

The Bulletin keeps them in touch with other industries, the *Journal* informs them what the scientists are doing in research, the *Abstracts* gives them an index to the current literature available on their particular problems. Also, the meetings of the Society, its Divisions, and its Sections provide a method of contact by which the work in scientific research is translated into terms, so that the operating man can use it in production. At these meetings experiences are exchanged and acquaintances made which broaden the vision of the practical operating man.

Many companies, now members of the Society, have found that it is an investment to pay the subscriptions to the American Ceramic Society for their operating men and also to send them to Meetings of the Society when it is at all possible, for often ideas thus obtained are put to such practical use that a thousand-fold return is obtained on the money thus spent.

The Membership Committee suggests that all members personally solicit the prospective corporations and their operating men to become members of our Society. Sell them a membership because the worth of the Society has been proved in your own experience. The Committee believes that "Winning With Wisdom" suggests a "New Deal"; a deal wherein all ceramists and ceramic corporations contribute ten and twenty-five dollars, and receive back data and information from the American Ceramic Society beyond value, because it is based on scientific research, proved by the practical man.

TO THE PRACTICAL CERAMIST

1934 — A New Year — A New Deal

Be WISE—Come WITH Us—and WIN

TENTATIVE PROGRAM OF THE ENAMEL DIVISION FOR THE ANNUAL MEETING, AMERICAN CERAMIC SOCIETY, FEBRUARY 11–16, 1934

(1) C. J. Kinzie and C. H. Commons, Titanium Alloy Research Laboratories, Niagara Falls, N. Y., "Opaque Zirconium Enamels and the Possibilities for Their Application in Glass, Glazing, and Enameling Industries."
(2) C. J. Kinzie and J. A. Plunkett, Titanium Alloy Research Laboratories, Niagara Falls, N. Y., "Zirconium Compounds as Opacifiers in Enamels and Glazes."
(3) G. H. McIntyre, Ferro Research Laboratories, Cleveland, Ohio, "The Graphical Computation of Opacity of Porcelain Enamels."
(4) C. J. Kinzie, Titanium Alloy Research Laboratories, Niagara Falls, N. Y., "Titanium Compounds and Application Thereof in Vitreous Enamels."
(5) Geo. H. Spencer-Strong and R. M. King, Ceramic Engineering Dept., Ohio State University, Columbus, Ohio, "Mechanics of Enamel Adherence: IX, Equilibrium Studies of Ground-Coat Glass and Cobalt, Nickel, and Iron Oxides."
(6) R. M. King, Ceramic Engineering Dept., Ohio State University, Columbus, Ohio, "Mechanics of Enamel Adherence: X, The Iron Oxide Layer in Ground-Coat Enamels."
(7) W. L. Housley and R. M. King, Ceramic Engineering Dept., Ohio State University, Columbus, Ohio, "Mechanics of Enamel Adherence: Progress Report on Application of Theory of Dendritic Adherence in Development of White Ground Coats."
(8) F. R. Porter and H. H. Holscher, General Electric Appliance Co., Chicago, Ill., "Use of Finely Milled Enamel Slips."
(9) A. I. Andrews and E. G. Porst, Ceramic Engineering Dept., University of Illinois, Urbana, Ill., "Effect of Water Hardness on Vitreous Enamel Suspensions."
(10) G. E. Terry and R. M. King, Ceramic Engineering Dept., Ohio State University, Columbus, Ohio, "Mechanics of Enamel Suspension: I, A Study of Valender Clay."
(11) A. I. Andrews and E. E. Howe, Ceramic Engineering Dept., University of Illinois, Urbana, Ill., "Effect of Fluorides on Thermal Expansion of Sheet-Iron Cover Enamels."
(12) D. J. McSwiney, Ceramic Engineering Dept., Ohio State University, Columbus, Ohio, "Enamels and Some Enamel Defects in the Light of Glass Technology."
(13) A. I. Andrews and R. E. Mullady, Ceramic Engineering Dept., University of Illinois, Urbana, Ill., "Further Data on Reboiling of Sheet-Iron Ground-Coat Enamels."
(14) A. I. Andrews and J. O. Lord, Ohio State University, Columbus, Ohio, "Discussion on Reboiling."
(15) Committee Reports.

PARTIAL PROGRAM OF THE REFRACTORIES DIVISION

Symposium on Crystalline Substances in Refractories

LEADER: E. W. WASHBURN

(1) Crystals, Solids, Glasses, and Liquids, by R. B. Sosman
(2) Methods of Inducing Crystallization, by E. W. Washburn
(3) Reactions in the Solid State, by N. W. Taylor
(4) Identification of Crystalline Substances by Means of the Petrographic Microscope, by T. N. McVay
(5) Identification of Crystalline Substances by Means of X-Ray, by B. E. Warren

Miscellaneous Papers

(1) Effect of Reheating on the P.C.E. of Refractories, by S. S. Cole
(2) Distribution of the Chief Refractory Clay Deposits of the United States, by J. R. Chelikowsky
(3) Some Special Studies of Refractory Georgia Kaolins, by W. Harry Vaughan
(4) Disintegration of Refractories in Various Special Atmospheres: I. Hydrogen; II. Cracked Natural Gas, by F. A. Harvey
(5) Approximate Composition of the Lowest Fusing Mixture of Barium Oxide, Magnesium Oxide, and Silica, by Cecil H. Turner
(6) Thermal Conductivity of Silicon Carbide, by Gordon B. Wilkes

R. E. BIRCH, F. H. NORTON, and K. E. BUCK
Program Committee, Refractories Division

PARTIAL AND PRELIMINARY PROGRAM OF THE GLASS DIVISION FOR THE ANNUAL MEETING

(1) W. E. S. Turner and Eric Preston, Sheffield, England, "Methods of Determining the Constitution of Glasses."
(2) W. E. S. Turner, Sheffield, England, "Recent Studies of the Fundamental Processes Underlying Glassmelting."
(3) K. Lark-Horovitz, Purdue University, Lafayette, Ind. (No title.)
(4) G. E. F. Lundell, Bureau of Standards, Washington, D. C., "Feldspar Analysis."
(5) E. E. Warner, General Electric Company, Schenectady, N. Y., "Recent Equipment for Automatic Control in the Glass Industry."
(6) W. T. Levitt, Corning Glass Works, Corning, N. Y., "Flame Working of Glass." (Luncheon talk.)
(7) S. S. Cole, 625 N. Allen St., State College, Pa., (*a*) "Vapor Pressure Sodium Borate," (*b*) "Compounds of Na_2O and B_2O_3."
(8) U. E. Bowes, Owens-Illinois Glass Company, Alton, Ill., (*a*) "Viscosity Measurements," by Hunter, (*b*) "Expansion Properties," by Wright, (*c*) "Solubility Tests," by Burch.
(9) J. T. Littleton, Corning Glass Works, Corning, N. Y., and H. H. Blau, Macbeth-Evans Glass Company, Charleroi, Pa., "Some Aspects of Glass Annealing—Influence of Heat Treatment on Diffusion Properties and Color of Glass."
(10) R. A. Miller, Pittsburgh Plate Glass Company, Pittsburgh, Pa., "Laminated Glass or Double Glazing" and/or "Tank Melting of Glass," by J. Gregorius.
(11) R. M. Curts, 233 Broadway, New York, N. Y., "Chemicals for Accelerating Glassmelting."
(12) G. W. Morey, Geophysical Laboratory, Washington, D. C., "Phase-Rule Studies on Glasses Containing Barium."
(13) F. W. Preston, Butler, Pa., "Constitution of Glass."
(14) F. P. Hall, Onondaga Pottery Company, Syracuse, N. Y., "Some Phases of Plastics in Relation to Ceramics."
(15) W. E. Dougherty, O. Hommel Company, Pittsburgh, Pa., "Fusible Enamels and Lusters for Coloring and Decorating Glass."
(16) S. R. Scholes, Alfred University, Alfred, N. Y., "Soda, Boric Oxide, Silica Glasses."

CONTRIBUTORS TO ART DIVISION PROGRAM

Additional Titles for Art Division Program*

Two more titles have been added to the Art Division program for the Annual Meeting.

(1) "History of Architectural Illumination" (Illustrated), by W. D'Arcy Ryan, Illuminating Engineer, General Electric Co., Schenectady, N. Y.

(2) "Pottery Making in the Ancient Near East" (Illustrated), by Neilson C. Debevoise, Oriental Institute, University of Chicago, Chicago, Ill.

* For list of papers already published for the program of the Art Division see *The Bulletin* for October, 1933, page 307.

W. D'Arcy Ryan

The slogan "Schenectady lights and hauls the world" is well founded, especially when it comes to lights, for in types of electric illuminating devices and methods of using this form of lighting, Schenectady has held the lead for many years.

And not only the work-a-day world but also many world's fairs are indebted to the lighting experts of the General Electric Co., particularly to W. D'Arcy Ryan who attracted notice in artificial illumination as early as 1899 and subsequently became one of the foremost illuminating engineers in the United States.

W. D'Arcy Ryan.

Although since the late 90's Ryan has blazed a trail in the field of illumination he is best known today for his outstanding and spectacular work in the lighting of expositions and other affairs requiring feature lighting.

Some of these include the Panama Canal Locks, Niagara Falls in 1907, the Hudson Fulton celebration in 1909, the Panama-Pacific International Exposition of 1915, the Rio de Janeiro Exposition in 1922, and A Century of Progress in 1933. Lending his engineering advice to all manner of lighting installations in Canada, the West Indies, Central and South America, Europe, New Zealand and Australia, China and Java, India, and Japan, he might better be called an International Illuminating Engineer.

These milestones in his career as a prominent illuminating engineer led to the Century of Progress of 1933. In this gigantic venture he played a part in planning and supervising that serves well as a fitting climax to his many accomplishments in this field.

Those fortunate enough to attend the American Ceramic Society Meeting at Cincinnati, February 11 to 16, will hear W. D'Arcy Ryan in an illustrated address entitled "History of Architectural Illumination."

And Mr. Ryan will not skip glass, terra cotta, and other ceramic materials and their part in developing impressive lighting schemes.

Dr. Neilson C. Debevoise

Digging down into pottery practices of the past has literally been one of the activities of Dr. Neilson C. Debevoise who will present a paper entitled "Pottery Making in the Ancient Near East" at the Art Division Session of the American Ceramic Society Meeting in Cincinnati on February 12, 1934.

Dr. Debevoise, after completing a scholarship and fellowship at the University of Illinois and then teaching history there for a year under Professor A. T. Olmstead, journeyed to Seleucia-on-the-Tigris, just south of Bagdad, and proceeded with his digging.

The work at Seleucia was carried on in 1930–1931 by the University of Michigan–Toledo Expedition, and as a member of this expedition Dr. Debevoise has first-hand knowledge of the highly interesting and significant materials which were unearthed in this area of ancient human activities.

In 1931–1932 at Tel Asmar, northeast of Bagdad, Dr. Debevoise was with the Iraq Expedition in quest of more buried antiquities, and again in Northern Syria at Rihanie in 1932–1933 he assisted in endeavoring to locate the site of the Biblical Calneh in a great mound known as Chatal Hüyük between Aleppo and Antioch.

Pottery was an important part of the excavated material and a complete account of this old pottery will later appear in a book by Dr. Debevoise entitled Parthian Pottery from Seleucia-on-the-Tigris.

Studies of ancient pottery and pottery methods are of interest and value to those engaged in ceramic activities, whether designing, manufacturing, or collecting, and the paper by Dr. Debevoise will indeed provide an unusual opportunity of acquiring information directly from a first-hand investigator.

ADDITIONAL MISCELLANEOUS TITLES FOR OUR ANNUAL MEETING PROGRAM

(1) R. A. Heindl, Bureau of Standards, Washington, D. C., "Olivine as a Refractory."

(2) Henry J. Miller, Radio Corporation, Newark, N. J., "Glass Problems in Radio Tube Manufacture."

(3) Professor Hawkins, University of Chicago, Chicago, Ill., "Glass Surfaces."

(4) Herbert Insley, Bureau of Standards, Washington, D. C., "Synthesis of Clay Minerals."

(5) J. H. Chesters and C. W. Parmelee, University of Illinois, Urbana, Ill., "Measurement of Reaction Rates at High Temperatures."

(6) G. W. Morey, Geophysical Laboratory, Washington, D. C., "Glass: the Integrating Factor in Ceramics."

(7) W. C. Rueckel, O. S. U. Engineering Experiment Station, Roseville, Ohio, "Properties of Various Insulating Refractories."

(8) A. S. Watts, Ohio State University, Columbus, Ohio, "Terminology of Ceramic Whiteware."

(9) C. W. Parmelee and William Horak, University of Illinois, Urbana, Ill., "Microstructure of Some Mat Lead Glazes."

(10) C. W. Parmelee and K. C. Lyon, University of Illinois, Urbana, Ill., "Study of Some Frit Compositions."

(11) Gordon Klein, New Castle Refractories Co., New Castle, Pa., "Improvements in Placing General Ware."

(12) H. R. Straight, Adel Clay Products Co., Redfield, Iowa, "New Continuous Clay Slip Dewatering Machine."

(13) K. G. Skinner and Hewitt Wilson, University of Washington, Seattle, Wash., "Tables and Factors for the Calculation of Nonmetallic Minerals."

(14) G. J. Middleton, "Note on Old Russian Chinaware."

GEORGE W. MOREY TO ADDRESS JOINT MEETING OF CINCINNATI SECTION, AMERICAN CHEMICAL SOCIETY, AND AMERICAN CERAMIC SOCIETY

TIME: Thursday night, February 15, 1934.

SUBJECT: Glass: The Integrating Factor in Ceramics.

SPEAKER: George W. Morey of the Geophysical Laboratory, Carnegie Institute, Washington, D. C., one of our own members and a consistent contributor to ceramic literature.

This Thursday night lecture will be instructive because of Dr. Morey's extensive personal experience in fundamental science research and in plant application.

JOSEPH SINEL.

JOSEPH SINEL TO DELIVER ADDRESS AT ANNUAL MEETING

The importance of design in the field of synthetic resin plastics has been generally recognized and such artist-designers as Joseph Sinel have contributed much to the commercial success of many well-known articles in that field.

At the Cincinnati Meeting next February, Mr. Sinel will present some of his views upon industrial designing in an illustrated lecture with the subject "The Importance of Design in Modern Industry."

Mr Sinel, a native of New Zealand, now lives in New York and is one of the foremost leaders in industrial design in this country.

ENAMELERS WILL VISIT ARMCO AND FRIGIDAIRE THURSDAY, FEBRUARY 15

By special buses an all-day excursion to Middletown and Dayton has been planned to see things of interest to enamelers at the American Rolling Mill Company and Frigidaire Corporation plants.

Those who return to Cincinnati with the buses will go to Louisville on Friday to see the plants of the Corhart Refractories Company, the Standard Sanitary Manufacturing Company, and the Louisville Enameled Products Company.

Two days of plant excursions for the enamelers.

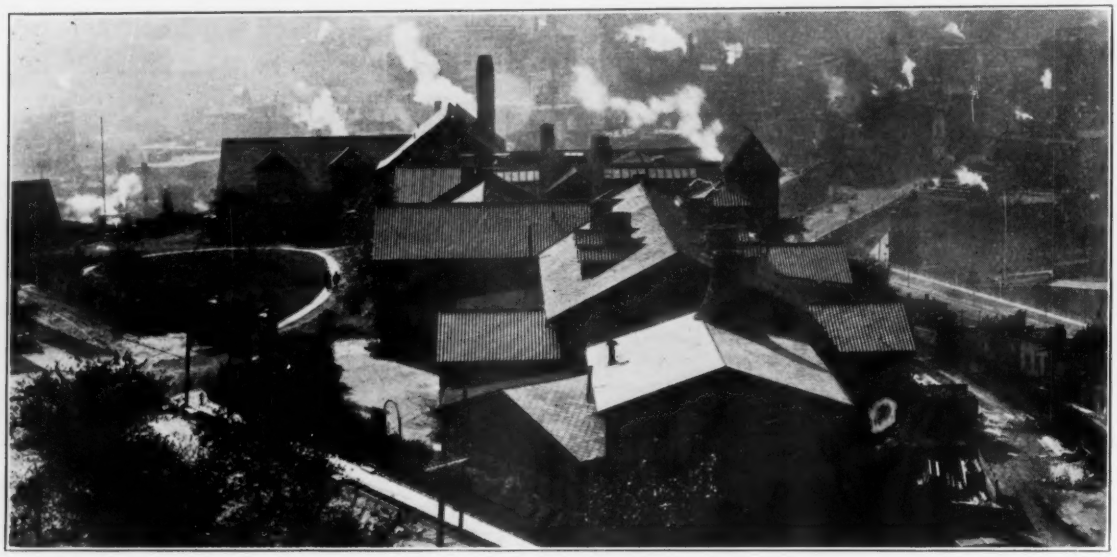
ROOKWOOD POTTERY

Rookwood, founded in 1880 by Mrs. Bellamy Storer, offers a unique opportunity for those interested in ceramic art to trace the development of glaze, color, and decoration. It offers, as it always has, the opportunities to the ceramist and artist to develop new ideas in glaze and decoration and for research unhampered by commercial consideration. At Rookwood one can follow the steps leading to the perfection of many types.

The influence of the ancient Chinese potters is seen in the fine examples of ox blood, Sung plum, and others. The Egyptian influence is felt in the luminous copper blues; in fact all sources of historical inspiration have played their part here.

In the field of original research there are examples of fine ware in the contemporary manner as well as pieces done in an earlier day which retain their appeal and charm.

Joseph Bailey, an English potter versed in the tradition of the Staffordshire Potteries, laid the foundation in the early days of Rookwood for the splendid accomplishments of Stanley G. Burt in the field of ceramics. Harold Bopp, now the active ceramist of Rookwood, will read a paper at the Annual Meeting of the American Ceramic Society on "Art in the Development of Rookwood Pottery."



The Rookwood Pottery.

THE NEWPORT ROLLING MILL COMPANY AND THE ANDREWS STEEL COMPANY WILL BE HOSTS AT OUR ANNUAL MEETING

Because of the faith of two men in the industrial progress of metropolitan Cincinnati there stands today a monument to their vision, foresight, and careful planning. The perpetuation of their ideals has developed two great plants known as the Andrews Steel Company and the Newport Rolling Mill Company.

When the two Andrews brothers, J. A. Andrews and A. L. Andrews, started the Globe Iron Roofing and Corrugating Company on the Public Landing in Cincinnati in 1885, another chapter was added to the industrial development of this section of the country.

This company sold only sheet metal and formed products used in building operations. Originally the sheets from which roofing, siding, and building products were made were purchased from the various rolling mills located in the eastern section of the United States. Before many years there was a realization that the company must secure control of its source of supply for sheets from which its products were made, and the old Swift Iron and Steel Company, located in Newport, Ky., was purchased. This property was a small two-stand rolling mill. It was purchased in 1890 and established as the Newport Rolling Mill Company. This company has expanded until it is operating hot mills as well as a galvanizing plant producing 150,000 tons of finished sheets annually which are shipped to all parts of the United States and foreign countries.

The Newport Rolling Mill Company, however, was dependent on steel plants from the eastern section of the country to furnish them with sheet bars which were later rolled into sheets, and the desire to control the source of supply prompted the Andrews brothers to build their own steel plant for producing sheet bars. This plant, put into operation in 1908 as the Andrews Steel Company, now produces 250,000 tons of ingots annually which are rolled into billets, sheet bars, and slabs.

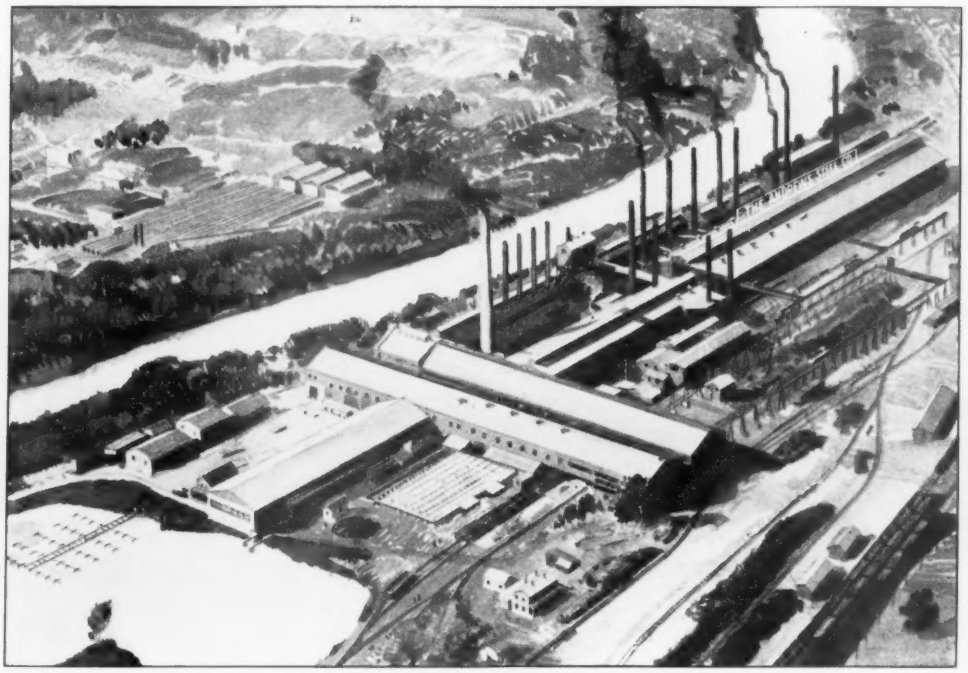
The sheet bars are sent to the Newport Rolling Mill Company which manufactures them into sheets for every purpose. Some of them are sent to the Globe Iron Roofing and Corrugating Company, now located in an adjacent building to the plant of the Newport Rolling Mill Company. Other sheets are sold for manufacture of electrical motors, automobile bodies, porcelain enamel stoves, ranges, refrigerators, household and office furniture, and for the many other purposes where iron and steel sheets are supplanting and taking the place of other less durable materials.

In 1915 the Newport Culvert Company was organized to manufacture corrugated metal culverts in use on many of the highways in the southern states. This company also draws its material from the Newport Rolling Mill Company.

During these years of development the products of these companies were improved in every conceivable way until today the reputation of "Globe brand" roofing and siding, "GOHI" pure iron copper alloy sheets and formed products, "GOHI" enameling sheets, and Newport electrical sheets is substantially known throughout this country.

The direction of these various industries has passed from the hands of the founders to that of the sons. J. B. Andrews, son of J. A. Andrews, is president of the Andrews Steel Company. A. K. Andrews, son of A. L. Andrews, is president of the Newport Rolling Mill Company. J. G. Andrews, another son of A. L. Andrews, is the president of the Globe Iron Roofing and Corrugating Company. F. M. Andrews, the third son of A. L. Andrews, is vice-president of the Andrews Steel Company.

To recall old memories, the site on which the Andrews Steel Company is located was formerly the old Queen City race track. The steel plant occupies one hundred and sixty acres with eight open-hearth furnaces with complete rolling equipment.



The Andrews Steel Company.

RESEARCH ACTIVITIES OF THE AMERICAN ROLLING MILL COMPANY

Where the Enamelers Will Visit on Thursday of Annual Meeting Week

When the American Rolling Mill Company began operations in 1900 its management realized that the greatest opportunity for growth lay in the development of specialty sheet products. This policy involved the creation of development facilities in the form of a research department and the inculcation of a pioneering spirit in the minds of the organization. Today its research activities are still comprehensive and many important contributions have been made.

F. A. TOBITT.

In 1906, in response to an insistent demand for a corrosion-resistant material, Armco ingot iron was developed after a long period of experimentation. Though primarily developed for corrosion resistance, ingot iron was found to possess many other properties when properly processed. It welded well, had unusual ductility, and was easy on the dies. In looking for a better porcelain enameling stock, a manufacturer learned that ingot iron possessed desirable enameling properties. It bonded unusually well and resisted warping. Stove and refrigerator manufacturers were probably the first to take advantage of this discovery on an extensive scale, first using ingot iron enameled stove parts for doors, legs, drip pans, splasher backs, etc. The all-porcelain enameled range and

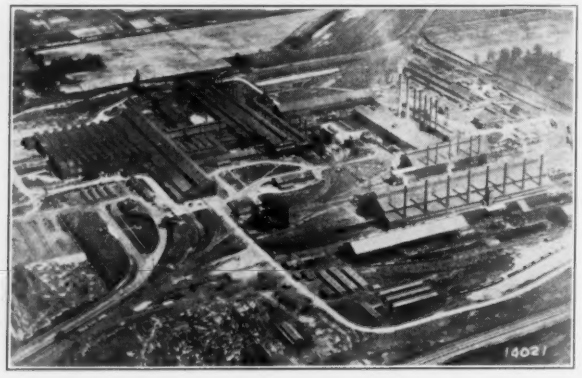


FIG. 1.—Airplane view of the American Rolling Mill Plant, Middletown, Ohio.

refrigerator is now the rule rather than the exception. As the popularity of porcelain enamel grew, the use of ingot iron enameling stock expanded until today a complete list of enameled articles made of it would be a catalog of practically all kinds of enameled ware produced.

Though the standard grade of ingot iron enameling was improved from time to time and enjoyed wide usage among manufacturers, a new grade was announced in 1932 known as "Armco crystal etched." More than two years were spent in the development of this new porcelain enameling iron. It affords better adherence qualities and may be processed under more variable conditions.

The Enameling Laboratory

For twenty years, Armco has worked with the porcelain enameling industry. Serving the industry meant understanding its problems. For that reason a special study of all the factors affecting porcelain enameling has been carried on. A porcelain enameling laboratory was established several years ago with a personnel which devotes its entire time to studying enameling problems. This laboratory contains the most modern equipment available, even a small enameling furnace. Studies are constantly in progress with respect to adherence and other conditions which give greater factors of safety under regular processing conditions. With a special photographic technique it is possible to study with a microscope the metal, the enamel, the bubble structure, the penetration of iron oxide, and the relation of processing conditions to the structure of the enamel.

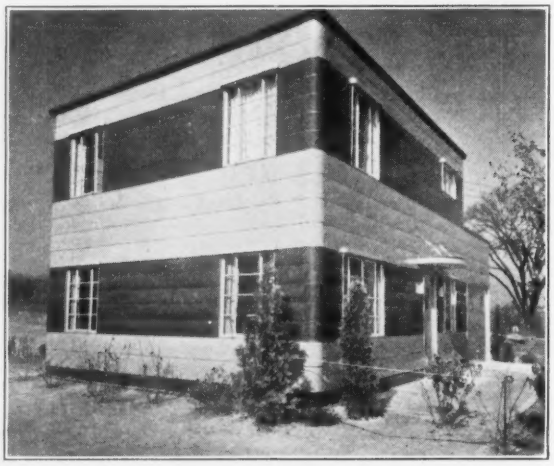


FIG. 2.—A porcelain enameled frameless steel house near Middletown.

With the many new potential uses of porcelain enamel now in sight, the American Rolling Mill Company feels that its faith in the industry which brought about so many unusual expenditures for development work is completely justified.

All of Armco's contributions were not confined to the porcelain enameling industry. It was one of the first companies to make special magnetic steel, and it took the lead in developing high finish automobile sheets and many other special products. In 1920 Armco developed the continuous sheet mill. This process is now being used by most of the leading steel producers under license arrangement. At the present time the company is coöperating with several companies in the development of the porcelain enameled frameless steel house.

Armco began operations in 1900 with one small plant in Middletown. It now operates large modern plants in Middletown and Zanesville, Ohio, Butler, Pa., and Ashland, Ky., employing about 11,000 men. The Sheffield Steel Corporation of Kansas City is a member of the Armco group, while there are numerous subsidiary companies in the United States and abroad. Armco's productive capacity is over a million tons of special analysis sheets. The company also manufactures stainless steel sheets, strip, and plates, railroad car wheels, and spiral welded pipe.

CERAMISTS TO VISIT CORHART REFRACTORIES COMPANY NEXT FEBRUARY

Electrocast Refractories

Friday Will Be the Big Louisville Day

With the intensive development of the glass machine and the consequent heavy demand on glass furnaces, it has long been apparent that construction materials which had been satisfactory for the easy service of "hand work" days would be unable to withstand economically the rigors of modern high temperature and heavy production. Consequently, the glass industry awakened to the fact that for most portions of glass-tank furnaces, refractories of a more resistant quality were not only desirable but actually necessary to continued development of machine production.

As a result of this awakening, the industry has for ten years been demanding better and better materials from the flux-block manufacturer. The suppliers of glasshouse refractories have responded by actively entering upon research programs for the betterment of their products. These research programs have had definite beneficial results. Clay blocks have been greatly improved.

The specifications of a flux-resisting material for a successful performance in modern glass practice are exacting. For modern service a tank block should have a high fusion point and a low porosity. Furthermore, its physical nature should be crystalline, as the crystal forms are the most resistant to corrosion effects. Although high fusion point and low porosity have always been considered a paradoxical condition for commercial purposes, the Corhart process actually makes commercially possible a tank block with a fusion point of cone 38, and a porosity of less than $1/2$ of 1% which is uniformly crystalline.

It is this product, the advantages of which have been amply demonstrated in hundreds of glass furnaces throughout the world, that the Corhart Refractories Company offers to the glass industry under the trade name of Corhart Electrocast. Corhart Electrocast is a refractory made by a patented process, in which selected refractory materials are fused in electric furnaces and then poured to shape in molds. After a thorough annealing, the product is ready for shipment.

Porosity: Less than 0.5%—therefore virtually no absorption.

Fusion Point: Cone 38 (3360°F) without any appreciable softening below that point.

Hardness: 8, mineralogist's scale, therefore ideal for use where abrasion and mechanical wear are severe.

Specific Gravity: Blocks weigh approximately 183 lb. per cu. ft.

Coefficient of Expansion: 0.000006 between room temperature and 900°C.

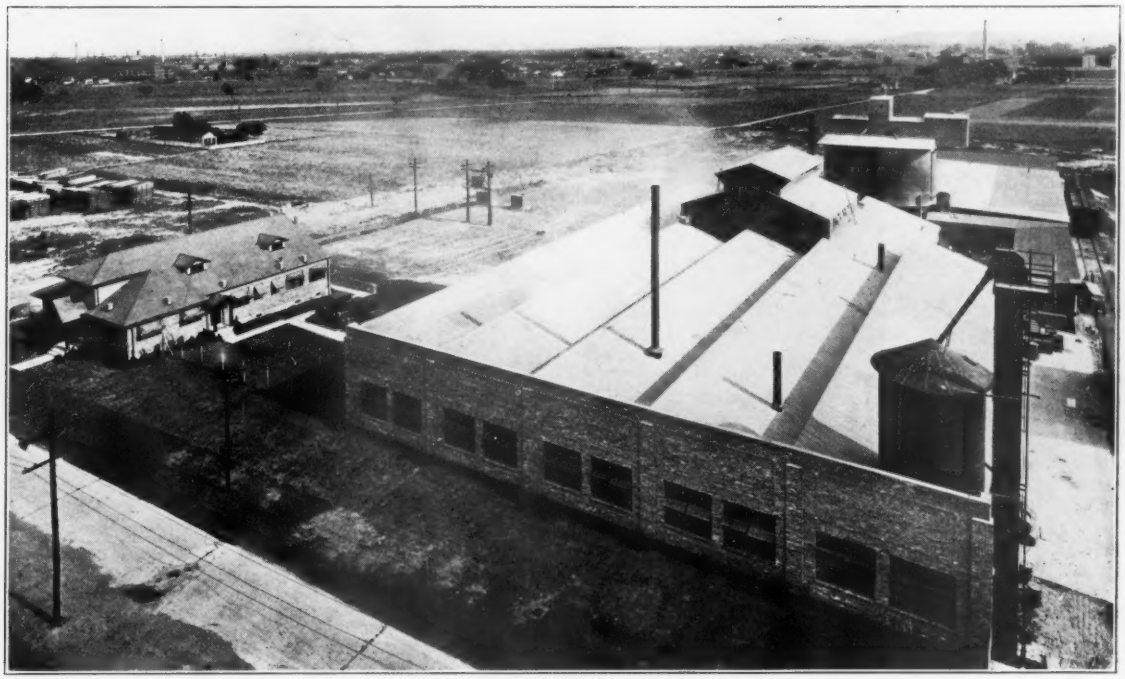
Specific Heat: 0.25 cal. per gm. per °C at 980°C.

Thermal Conductivity: 0.006 gm. cal. per °C per sq. cm. per cm. per sec.

Composition: Crystalline mullite.

Corrosion: Because of its low porosity and its inherent chemical make-up, Corhart Electrocast is extremely resistant to the corrosive action of slag, ashes, and glasses.

Corhart Electrocast is made in various stock shapes and in many special shapes, the stock brick and blocks ranging from $2\frac{1}{2}$ x $4\frac{1}{2}$ x 9 to 18 x 24 x 48 inches.



Corhart Refractories Company.

THE LOUISVILLE ENAMELED PRODUCTS COMPANY INVITES MEMBERS OF THE AMERICAN CERAMIC SOCIETY

Friday, February 16, 1934

The plant of the Louisville Enameled Products Company was built in 1927 by the Ferro Enamel Corporation of Cleveland, Ohio. The equipment installed in this plant was an example of the finest development in porcelain enameling (wet-process) equipment at that time. It consists of one 5- by 12-foot electric furnace, one 5- by 12-foot oil-fired furnace with a high muffle, and a small double continuous electric furnace, developed for large production on small stampings.

The plant is thoroughly equipped to enamel both cast-iron and sheet-metal parts. In 1930 an addition was built for a metal-working department which was equipped with presses and hand-forming equipment. This has been a big factor in the development work undertaken by the Company.

During 1931 the Louisville Enameled Products Company developed the manufacture of a porcelain steel wall tile which amounted to considerable volume during that period. In 1932 the Company developed a construction for small porcelain buildings and has since been the producer of the largest volume of these buildings for oil stations, small restaurants, etc.

According to P. B. McBride, the plant is producing quite a few of these buildings for various markets.

FRED S. THOMPSON.

Corhart Refractories Company, Cincinnati, Ohio.

LOUISVILLE POTTERY COMPANY INVITES ANNUAL MEETING DELEGATES

E. A. Ardern of the Louisville Pottery Company writes as follows: "We shall be very glad to welcome to our plant any of the delegates who make the trip to Louisville on Friday, February 16."

The Louisville Pottery Company makes stoneware specialties in several colors, flowerpots, Cherokee hand-turned art pottery, and garden and outdoor pottery. It has six kilns and employs fifty persons.

ANOTHER LOUISVILLE PLANT EXTENDS INVITATION

The Standard Sanitary Manufacturing Company, Division of the American Radiator Company, employs approximately 3000 persons. In normal periods it has given employment to over 5000 persons. It covers about fourteen acres and ranks as one of the largest factories of its kind in the world.

The products are enameled iron bathtubs, sinks, lavatories, etc., brass goods, and small china articles such as soap dishes, faucet handles, etc. Dry-process enameling is used. The steps in process are casting, cleaning, and enameling. The plant has a cafeteria and a recreation building for the use of the employees.

Erwin Sohn and his gang will be our guides.

ADVICE TO MEMBERS RESPECTING REDUCTION AUTHORIZED ON THE CERTIFICATE PLAN

A concession of one and one-third fare on the "Certificate Plan" will apply for members and dependent members of their families attending the Meeting of the American Ceramic Society and the National Brick Manufacturers Research Foundation to be held at the Netherland Plaza Hotel, Cincinnati, Ohio, February 11 to 16, 1934.

The following directions are submitted for your guidance:

(1) Tickets at the regular one-way tariff fare for the going journey must be obtained on February 8 to 14, inclusive (but not on any other date).

Be sure that when purchasing your going ticket you request a "Certificate Plan" certificate from the ticket agent. Do not make the mistake of asking for a "receipt."

(2) Present yourself at the railroad station for your ticket and certificate at least thirty minutes before the departure of the train on which you begin your journey.

(3) *Certificates are not kept at all stations.* It is suggested that you inquire at your home station and ascertain whether or not the agent can issue a through ticket and certificate to the place of meeting. If not, the agent will inform you of the nearest station at which they can be obtained.

(4) Immediately on your arrival at the Meeting, present your certificate to the endorsing officer, Ross C. Purdy, General Secretary of the American Ceramic Society, as the reduced fare for the return journey will not apply unless the certificate is properly endorsed by him and validated by a railroad special agent as provided for by the certificate.

(5) Arrangements have been made for validation of certificates by a special agent of the carriers on February 12 to 16, inclusive, provided such certificates or a combination of such certificates and round-trip trickets, held by members of the organization and dependent members of their families, issued under following conditions, aggregate not less than 100:

Certificates showing the purchase of one-way tickets on authorized dates of sale and from authorized territory from which the one-way adult tariff fare is 75 cents or more.

Round-trip excursion tickets of all classes, including round-trip clergy tickets, sold prior to or on dates of sale authorized for the meeting from points from which the one-way adult fare to the place of meeting is $2.00 or more.

Certificates or tickets issued for children of half-fare age to be counted the same as adult certificates or tickets.

(6) No refund of fare will be made because of failure to obtain a proper certificate when purchasing going ticket.

(9) Tickets so purchased will be good for return passage to reach the original starting point within 30 days in addition to date of sale of going ticket as shown on the certificate.

THE AMERICAN CERAMIC SOCIETY ANNOUNCES AN OFFICIAL MEMBERSHIP KEY

The Key illustrated above is actual size and has been adopted as the official symbol of the Society. It may be had for any of the following subdivisions of the Society: Member, Fellow, Active, Corporation, Student, and Past-President. The Key will be the same for all groups except the name bar which, of course, will conform in lettering to the group for which it is intended. The illustration is of a Fellow Key.

All members are urged to wear this official emblem as a distinguishing sign. It is to your advantage and to that of the Society that you identify yourselves in this manner.

The price of the Key in 10K solid gold is $6.50 and in 20-year gold filled quality with 10K key ends, $3.25.

A convenient order form is appended. Use it now and mail your order with full remittance to

Ross C. Purdy, General Secretary,
American Ceramic Society,
2525 North High Street,
Columbus, Ohio.

Shipment will be made directly from the official jewelers, The L. G. Balfour Company, Attleboro, Mass., on a prepaid basis. A permanent guarantee against defective workmanship and material is provided by the manufacturers.

Order Blank

Ross C. Purdy,
American Ceramic Society,
2525 North High Street,
Columbus, Ohio.

Dear sir:

I enclose $ for which please send me one official American Ceramic Society Key. (Write in status, *e.g.*, Member, Fellow, etc.)

I desire my Key to be 10K solid gold—gold filled. (Underline choice.)

I understand this will be mailed to me promptly, postage prepaid.

University of Toronto

The registration in ceramics is low this year and the study of the fire clays of Northern Ontario is being continued. Other activities of interest are as follows:

(1) A coöperative research program through the Canadian Ceramic Society will include the Ceramics and Road Materials Division of the Mines Branch, Ottawa, the Brick Manufacturing Association, and the Structural Clay Tile Association. The Ottawa laboratory will do most of the work but the planning of the program has been done by the Research Committee of the Canadian Ceramic Society.

(2) The Ontario Government has given the industry permission to use the facilities of the Government owned brick plant at Mimico for certain experimental work.

(3) R. J. Montgomery, Associate Professor of Ceramics, will give a series of lectures on ceramics to a group of plant executives and salesmen and another series of lectures on glaze composition to members of a local handicraft guild who are interested in pottery.

CERAMISTS TO SEE FELDSPAR AND CYANITE DEPOSITS AND PLANTS*

The Committee in charge of the Electrochemical Society–American Ceramic Society trip to the Spruce Pine district consists of B. C. Burgess, *Chairman*, Tennessee Mineral Products Corporation, Spruce Pine, N. C., V. L. Mattson, Celo Mines, Inc., Burnsville, N. C., and W. F. Deneen, North State Feldspar Corporation, Micaville, N. C.

The Spruce Pine district covers a great deal of territory and comprises some of the most modern feldspar mills, the world's largest feldspar deposits, modern kaolin washeries and mica recovery plants, mica plants, and a cyanite mill and mine. The center of this district is only forty miles from Asheville.

This joint meeting will be held April 26, 27, and 28 at Grove Park Inn, Asheville, N. C.

Massachusetts Institute of Technology

There has been a considerable increase in the enrollment of the graduate courses in ceramics and in the students registered for the newly arranged course in optical ceramics.

D. T. H. Shaw, who received his doctorate at the Massachusetts Institute of Technology three years ago, has studied further in England, France, and Germany and recently returned to his home in China. He has been made director of the laboratory of ceramic research which is engaged in reproducing the finer types of old Chinese ware. He has also been made commissioner of ceramic industries of the Province of Kiangsi which for many centuries has been the seat of China's ceramic manufacture. Dr. Shaw's intimate knowledge of the modern ceramic processes used in various countries together with his background of Chinese art and craftsmanship should enable him to produce ware of great artistic and technical merit. Last summer Dr. Shaw was sent by his country to the Century of Progress exhibit in Chicago with a fine collection of Chinese ceramics.

V. J. Duplin, Jr., who received a Master's degree last June in ceramics, is conducting research on refractories under a Babcock & Wilcox Fellowship at the Institute. He has been connected with the development of an insulating refractory which is now being produced in quantity.

F. B. Hodgdon, who received a Master's degree, is now working on his Doctor's degree at Iowa State College.

Considerable additions have been made to the space allotted to the ceramic work at the Institute during the last year, and new equipment has been installed, such as a complete equipment for making dust-pressed tile. Three electric furnaces have been constructed with automatic temperature controllers capable of maintaining a temperature within ±0.2°C. These furnaces are to be used for dehydration experiments on clay and annealing tests with glass. Recently a high-pressure autoclave has been installed for testing glazed tile.

An investigation is being carried on to determine the effect of porosity of a glazed tile on its weather resistance and mortar adherence. This work is being done on a red bodied tile with a white tin enamel glaze, and the weathering tests are to be correlated with autoclave and freezing tests.

Work is also being carried out on the dehydration and rehydration of clays in an attempt to throw some light on their origin and the change in structure during heating.

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*See *The Bulletin*, **12** [11], 326 (1933) for program outline.

NOTES AND NEWS

NOTES FROM THE CERAMIC SCHOOLS

Ohio State University*

The following men with advanced degrees have secured new positions:

Roy D. Beck, Professional Degree '32, Westinghouse Electric & Mfg. Company, Mansfield, Ohio.
C. D. Evans, M.Sc. '32, Universal Clay Products Company, Sandusky, Ohio.
Paul R. Jones, M.Sc. '32, D. L. Auld Company, Columbus, Ohio.
Karl M. Kautz, M.Sc. '33, Republic Steel Corporation Massillon, Ohio.
Lewis H. Keller, M.Sc. '33, National Tile Company, Anderson, Ind.
J. A. Martz, Ph.D. '33, Bailey & Sharp Company, Hamburg, N. Y.
E. T. Montgomery, Professional Degree '33, Smith & Stone, Ltd., Georgetown, Ontario.
R. R. Rhodes, M.Sc. '33, E. J. Lavino Company, Norristown, Pa.
H. J. Rolke, M.Sc. '32, British Ceramic Service Company, Glasgow, Scotland.
W. C. Rueckel, Ph.D. '33, The Bonnot Company, Canton, Ohio.
Ralston Russell, Jr., M.Sc. '33, A C Spark Plug Company, Flint, Mich.

Those graduating with a degree of Bachelor of Ceramic Engineering who have secured new positions are as follows:

A. S. Ault, '31, General Electric Company, Erie, Pa.
Cyril Bradwell, '32, A. P. Green Fire Brick Company, Mexico, Mo.
H. D. Callahan, '19, U. S. Quarry Tile Company, East Sparta, Ohio.
G. H. Duncombe, '15, National Aluminate Corp., Chicago, Ill.
R. H. Ellis-Anwyl, '28, Camark Pottery, Camden, Ark.
G. M. Grady, '25, Redwing Stoneware Co., Redwing, Minn.
Ralph E. Hanna, '22, National Tile Co., Anderson, Ind.
Russell K. Johnston, '33, Owens-Illinois Glass Co., Columbus, Ohio.
R. O. Lane, '30, American Steel & Wire Company, New Haven, Conn.
W. E. Medert, '32, University of Washington Ceramic Fellowship, Seattle, Wash.
J. M. Neff, '28, Columbus Dental Mfg. Company, Columbus, Ohio.
L. F. Sixt, '32, National Tile Co., Anderson, Ind.
J. E. Trees, '31, National Tile Co., Anderson, Ind.
W. F. Yeagley, '33, Owens-Illinois Glass Company, Columbus, Ohio.

This fall the Department of Ceramic Engineering has received two useful gifts, an extrusion machine and a filter press. The Westinghouse Electric & Manufacturing Company was the donor of the extrusion machine, while the filter press is the gift of the Ohio Brass Company.

The space vacated by the Columbus Station of the U. S. Bureau of Standards in Lord Hall has been assigned to the Department of Ceramic Engineering, the Department of Mine Engineering, and the Department of Mineralogy. The ceramists acquired four research rooms on the second floor, the machine room in the basement, and the kiln shed. The mining engineers have been assigned two research rooms on the second floor, and the mineralogists have received all of the space vacated on the main floor. The rooms acquired by the Ceramic Department will be devoted entirely to graduate research.

* A. S. Watts, *Chairman*, Ceramic Engineering Department.

Pennsylvania State College

Three men are registered this fall for advanced degrees in ceramics.

Roy W. Maize, who was graduated from Penn State a year ago, is studying structure changes which occur in the firing of aluminum oxide at various temperatures. He has constructed an interferometer for exact expansion measurements of solids at high temperatures. Mr. Maize is a candidate for the M.S. degree.

Sandford S. Cole, who was connected with the Koppers Research Laboratory at Mellon Institute for a number of years, is a candidate for the Ph.D. degree. Mr. Cole is the author of a number of papers on silica brick and mortars. He recently obtained his M.Sc. degree at Alfred University. Mr. Cole is measuring vapor pressures of certain glass constituents.

Gordon R. Pole is working for a Ph.D. degree in Ceramics. His experience covers several years with Mellon Institute, the U. S. Bureau of Standards, and the Pittsburgh Plate Glass Co.

New York State College of Ceramics

The enrollment this year of 285 is well divided among the departments of Ceramic Art, Glass Technology, and General Ceramic Technology and Engineering. This enrollment compares with 245 last year and 168 the year before. The enrollment is now being curtailed, about 20 having been refused admittance this year. Although the size of the school has been doubled it is already crowded.

The first meeting of the Student Branch of the Ceramic Society was held on Wednesday, October 25. W. T. Levitt of the Corning Glass Works gave a highly interesting lecture and demonstration on the making of glassware.

The Ceramic Guild of the Ceramic Art Department held a festival on December 9, 1933.

A new X-ray laboratory is being equipped and a course in this subject is being introduced by Professor C. R. Amberg.

Dr. S. R. Scholes is writing a book on glass technology. This book is intended for plant men as well as students.

Professor Fosdick and her faculty of the Ceramic Art Department exhibited the work of that department at the University Convocation held in Albany, October 12 and 13. Several ceramic industries of the state and the Crossley Machine Company coöperated. This exhibit effectively presented the character of the art work of this institution to the many delegates from the other institutions of the State.

University of Illinois Ceramic Short Course in January

Announcement is made by the Department of Ceramic Engineering of the University of Illinois, Urbana, Ill., that plans are being made for a series of short courses to be given in late January, 1934. These will be (1) Bodies and Glazes, (2) Enamels, and (3) Structural Clay Products. Each will be complete in itself but a combination of the lectures on structural clay products and bodies and glazes is recommended. The Structural Clay Products will be given during the first week and the other courses during the second week. Programs will be sent to applicants who write to Prof. C. W. Parmelee, Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

Pennsylvania State Ceramic Research Project

The Committee on Projects of the Geological Society of America recently announced the approval of a grant of twenty-five hundred dollars to Nelson W. Taylor, Head of the Department of Ceramics, Pennsylvania State College, State College, Pa. This grant is made for the study of reactions between solids, in the absence of a liquid phase, in the temperature range of 600 to 1200°C. The work is planned to cover two problems, namely, the synthetic study of known mixtures in the laboratory under exactly known and carefully controlled temperature conditions, and the exposure of test pieces at or near thermocouple installations in a tunnel kiln where they will remain at high temperatures for several months at a time. The work is designed to determine the stable solid phases at various temperatures, to locate transition temperatures of polymorphous materials, and to gain more insight into the problem of solid solutions. These problems are of great ceramic benefit as well as of geological interest.

Francis J. Williams has been appointed research assistant to Dr. Taylor in connection with this work. Dr. Williams is a graduate of the New York State College of Ceramics, and holds a Ph.D. degree from Ohio State University, 1932.

In order to accelerate the studies of chemical and physical changes of materials placed in tunnel kilns or in similar heated zones for long periods of time, Dr. Taylor is anxious to secure samples of brick, refractory cement, car furniture, etc., which have had protracted service at high temperatures in kilns, glass tanks, furnaces, etc. Thin sections of these materials will be made for petrographic examination and in some cases powdered samples will be examined by X-ray diffraction methods. Samples sent in for examination should be accompanied by statements of chemical composition, temperature history, and other pertinent information. Dr. Taylor requests the coöperation of all who are engaged in practical ceramics in collecting useful and reliable information on solid-phase reactions. Samples should be mailed to 111 Mineral Industries Building, Pennsylvania State College, State College, Pa.

University of North Carolina

The Department of Ceramic Engineering at the State College of Agriculture and Engineering, University of North Carolina, is publishing a report entitled "The Occurrence, Properties, and Uses of the Commercial Clays and Shales of North Carolina." The report covers a complete investigation of the materials suitable for the manufacture of structural products and includes chemical, physical, and mineralogical properties, geology, location, and extent of deposits, and uses to which the materials are best suited. The investigation was made entirely by the staff of the department and represents several years work. The authors are A. F. Greaves-Walker, W. L. Fabianic, and N. H. Stolte.

The department has been investigating the possibility of substituting North Carolina "Cornwall Stone" for the English material. Large deposits of the North Carolina stone are available.

The investigation, which has not been completed, indicates that the North Carolina stone is superior to the English. It is expected that a report will be available within the next few months. G. A. Wills is carrying on the work under the direction of Professor Greaves-Walker.

G. A. Wills is also investigating the possibility of using cyanite as an opacifier in metal enamels.

The Student Branch of the American Ceramic Society at the State College of Agriculture and Engineering of the University of North Carolina held its annual initiation on November 7, accepting into membership the largest class in its history.

Those initiated were as follows:

Actives: H. B. Foster, Edmund Jones, Jr., E. B. Smith, H. M. Hamburger, A. S. Lloyd, C. S. Finch, L. M. Howland, and B. G. Upham.

Associates: Sam A. Ashe, III, B. S. Clapp, J. W. Ogletree, W. C. Bell, A. R. Blackburn, K. M. Keeney, R. B. Lisk, and Gus Palmer, Jr.

The officers of the branch this year are W. R. McLain, president, D. L. Bohannon, vice-president, J. B. Sauls, secretary, and H. M. Hamburger, treasurer.

ORGANIZATION MEETING OF THE NEW YORK CERAMIC INDUSTRIES ASSOCIATION

Assembled at the Ceramic College, Alfred, N. Y., November 9, 1933

The meeting was called to order by Dean M. E. Holmes. He stated that there were two reasons for calling this meeting: (1) to organize an association of ceramic manufacturers in New York State sponsored by the New York ceramic manufacturers, and (2) to decide whether such an association, if organized, would give backing to the proposition of establishing a ceramic experiment station at Alfred.

Twenty-nine manufacturing companies had representatives present. Sixteen other companies sent proxies.

A letter was authorized to be sent to Governor Lehman and the Director of the Budget in support of the project for an experiment station worded as follows:

The New York Ceramic Industries Association which assembled in convention at Alfred, N. Y., November 9, 1933, with representatives from the glass, heavy clay products, gypsum, refractories, whiteware, terra cotta, and raw materials industries has studied the matter of an appropriation by the State for an experiment station at the New York State College of Ceramics. This request for an appropriation was endorsed and its approval was urged for the best interests of the entire population and the ceramic industries in particular.

The Constitution and By-Laws were drawn up and accepted.

The following officers were elected:

President, J. L. Jova
Secretary-Treasurer, M. E. Holmes

BOARD OF DIRECTORS

Heavy Clay Products, J. L. Jova and Clarence Austin
White Wares, E. W. Schramm
Glass, J. C. Hostetter
Gysum, Lime, Cement, F. M. Thorman
Terra Cotta, M. C. Gregory
Enameled Ware, E. G. Miner
Refractories and Abrasives, C. J. Easter
Member-at-Large, M. E. Holmes

Just after adjournment a wire was received with the information that Ross Purdy and George Bole, who were on their way from Columbus, Ohio, to help make this meeting a success, were seriously injured in an automobile accident at Westfield, N. Y. (Note: Nov. 22. Mr. Purdy is at home and Mr. Bole is recovering rapidly.)

WHY NOT MORE CERAMIC CONSTRUCTION MATERIAL IN GOVERNMENT BUILDINGS?

The clay mining industry of the United States is suffering keenly from conditions affecting one of our largest outlets, the manufacture of architectural terra cotta, hollow building tile, and other ceramic structural products, and our Trade Association appeals to all in authority to lend their support in every way possible so that the unemployment situation in the industry can be sufficiently improved to promise a living, at least, to the many thousands of men and their families who depend upon this industry for existence.

As is well known, most mining operations are located in isolated districts where it is impossible for men to get other employment in case of cessation of production and where suffering is the general result of unemployment.

At a recent meeting of the New Jersey-Maryland Division of the American Clay Association the following resolution was unanimously passed.

WHEREAS, The American Clay Association's membership is composed of individuals, corporations, and firms engaged in the business of mining, producing, and selling clays of all kinds as a raw material used in the manufacture of products of which clay is a part, and

WHEREAS, Architectural terra cotta, hollow tile, and other ceramic structural products represent a large part of the clay-consuming industry and have been manufactured for national distribution for over fifty years in factories geographically located so as to economically serve building construction in all states in the union, and

WHEREAS, Economic recovery of our nation depends upon adequate payroll distribution, and this being essentially a handmade product, the ratio of payroll dispersed in the production of these materials is more than 50% of the total cost,

Therefore Be It Resolved, That all National and State authorities responsible for public construction, supervising architects, and private architects under their control, be hereby requested to recognize fully the merits of architectural terra cotta and other ceramic building materials by specifying a fair proportion for all National and State building, wherever possible, for exterior or interior use in all public and other construction, not only for its superior value as a first-grade building material, but so that the vast number of men formerly directly or indirectly employed in the clay mining and manufacturing industries and now unemployed may fairly participate in the spread of work from the funds to be expended, thus relieving their distress.

The consideration of all National and State public officials is respectfully solicited.

AMERICAN CLAY ASSOCIATION
Geo. C. Crossley, *President.*
W. Guy Weaver, *Chairman*, N. J. & Md. Div.

FLOURISHING ALL-NEW HAMPSHIRE POTTERY INDUSTRY ENVISIONED IN EXPERIMENTS AT DURHAM*

Pottery was made at the Lamson Pottery in Exeter, N. H., from native clays until the first part of this century and in Keene, N. H., from imported clays until about the same time.

The idea of reviving the pottery industry in New Hampshire started with the Old Dover Home Industries which is affiliated with the New Hampshire Arts and Crafts league. Each group of the league specializes in making things which are handy to work with, so Dover, with an abundance of clay in the vicinity, turned to pottery.

O. MASON BURROWS.

Examples of pottery made at the University of New Hampshire.

O. Mason Burrows of Exeter began to experiment with different types of clay in an effort to make pottery out of local products.

Dean George W. Case of the University of New Hampshire heard about the work and offered Mr. Burrows the use of the University of New Hampshire laboratories to carry on his research.

The Old Dover Home Industries has been conducting classes in pottery making at the university. Three terms of six weeks each attracted more than forty clayworkers. The work was done in a room loaned by the university and classes were held twice a week under the direction of Helen B. Munroe of Boston.

Mr. Burrows is a graduate of Massachusetts Institute of Technology and is the son of Henry C. Burrows, owner of the Star Brick Company in Epping.

WHY NOT GOVERNMENT RELIEF FUNDS FOR CERAMICS?

Here Is an Example

The establishing of a course in ceramics for the unemployed or partly employed is being planned at Crooksville, Ohio. The class will be in charge of Stanley Leaver of Shawnee, graduate of ceramic engineering at Ohio State University. There will be no tuition charge. The teacher's salary will be paid from relief funds.

* From *The Manchester Union*, Aug. 22, 1933.

WIN THAT NEW MEMBER

MONEY
WELL
SPENT

Says a prominent

Manufacturer of

High Grade Glassware

SIMPLEX Designs meet the most exacting specifications and are preferred for performance. The cost is relatively little when results are considered.

SIMPLEX Equipment creates repeat orders and retains prestige

SIMPLEX
ENGINEERING COMPANY

WASHINGTON TRUST BLDG. WASHINGTON, PENNA., U. S. A.

Mr. Ceramist—

We have { *The Clay* / *The Facilities* / *The Experience*

H. C. SPINKS CLAY COMPANY
NEWPORT, KY.

THREE ELEPHANT
BORAX
REG. U.S. PAT. OFF. REG. U.S. PAT. OFF.
AND BORIC ACID
GUARANTEED OVER 99.5% PURE
AMERICAN POTASH & CHEMICAL CORPORATION
70 Pine Street, New York

PREPARE FOR 1934

DECEMBER is an inventory month and gives you more than the usual time on the development of new products for the coming year. This month can best be used for planning your 1934 activities. Where your plans call for a continuance of your 1933 line, the Ceramic Color and Chemical Manufacturing Company can help you by maintaining the same uniformity of product. In planning your new line, our laboratory is ever ready to produce new colors, new effects, and to offer suggestions.

The Ceramic Color and Chemical Manufacturing Company is looking forward to serving you, and takes this opportunity of wishing you a Merry Christmas and a Happy New Year.

CERAMIC COLOR & CHEMICAL MFG. CO.
NEW BRIGHTON PENN'A.

Refractory Materials

Products of the Electric Furnace

SILICON CARBIDE
ARTIFICIAL MULLITE
SILICON CARBIDE FIRESAND
FUSED ALUMINUM OXIDE
FUSED MAGNESITE

Furnished in raw material form, ground to meet specifications.
Our Research Department with fully equipped laboratories is always at your service.
WRITE US ABOUT YOUR PROBLEMS

THE EXOLON COMPANY

Established 1914

Electric Furnace Plant { THOROLD, ONTARIO
Finishing Plant, General Offices { BLASDELL, N. Y.

PAPER MAKERS IMPORTING CO. INC. EASTON, PENNSYLVANIA U.S.A.

FINEST POTTERY CLAYS

BUYERS' GUIDE

A

Abrasives (Alundum-Crystolon)
Norton Co.

Aloxite (Refractory Products)
Carborundum Co.

Alumina (Hydrate and Calcined)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Aluminum Oxide (Fused)
The Exolon Co.
The Vitro Mfg. Co.

Alundum (Refractory Products)
Norton Co.

Ammonium Bifluoride
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Ammonium Carbonate
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Antimony Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

B

Ball Mills
McDanel Refractory Porcelain Co.

Ball Mills (Laboratory Type)
Ceramic Color & Chemical Mfg. Co.

Barium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Batts
Carborundum Co. (*"Carbofrax Aloxite"*)
Norton Co. (*Alundum Crystolon*)

Bitstone
Potters Supply Co.

Blocks (Refractory)
Carborundum Co.
Norton Co.

Borax
American Potash & Chemical Co.
Drakenfeld & Co., B. F.
Pacific Coast Borax Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Borax Glass
Pacific Coast Borax Co.

Boric Acid (Anhydrous)
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Co.
Drakenfeld & Co., B. F.
Pacific Coast Borax Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Bricks (Refractory)
Carborundum Co. (*"Carbofrax Aloxite"*)
Norton Co.

C

Carbofrax (Refractory Products)
Carborundum Co.

Carbolon (Refractory Products)
The Exolon Co.

Carbonates (Barium, Lead)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Caustic Soda
Ceramic Color & Chemical Mfg. Co.
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Cements
Carborundum Co.

Ceramic Chemicals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Chromium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Clay (Ball)
Ceramic Color & Chemical Mfg. Co.
Hammill & Gillespie, Inc.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Potters Supply Co.
The Roessler & Hasslacher Chemical Co.
Spinks Clay Co., H. C.
The Vitro Mfg. Co.

Clay (China)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Edgar Brothers Co.
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Clay (Electrical, Porcelain)
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Spinks Clay Co., H. C.
The Vitro Mfg. Co.

Clay (Enamel)
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Metal & Thermit Corp.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Clay (Fire)
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Potters Supply Co.

Clay (German Vallendar)
Ferro Enamel Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Clay Miners
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Spinks Clay Co., H. C.

Clay (Potters)
Paper Makers Importing Co.
Spinks Clay Co., H. C.

Clay (Sagger)
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Potters Supply Co.
Spinks Clay Co., H. C.

Clay (Wad)
Kentucky-Tennessee Clay Co.
Potters Supply Co.
Spinks Clay Co., H. C.

Clay (Wall Tile)
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Spinks Clay Co., H. C.

Clocks (Gauge Board)
Ferro Enamel Corp.

Cobalt Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Colors
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Cornwall Stone
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Cornwall Stone (Imported)
The Roessler & Hasslacher Chemical Co.

Crucibles (Filter, Melting, Ignition)
Norton Co.
Potters Supply Co.

Crystolon (Refractory Products)
Norton Co.

D

Decorating Supplies
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Drying Machinery
Ferro Enamel Corp.

E

Electrical Porcelain
Paper Makers Importing Co.

Enameling Equipment (Complete)
Chicago Vitreous Enamel Products Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

Enameling Furnaces
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Norton Co.
Porcelain Enamel & Mfg. Co.

Enameling Iron (Sheet)
American Rolling Mill Co.

Enameling Muffles
Carborundum Co. (*Carbofrax*)
Norton Co. (*Alundum*)

Enameling (Practical Service)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.
Titanium Alloy Mfg. Co.

Enamels
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Enamels (Porcelain)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Metal & Thermit Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.
Titanium Alloy Mfg. Co.

Equipment (Porcelain Enameling)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

Exolon (Refractory Products)
The Exolon Co.

BUYERS' GUIDE (continued)

F

Feldspar
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Fire Brick
Carborundum Co.
Norton Co.

Flint
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Flint Pebbles
Ferro Enamel Corp.

Floors (Non-Slip)
Norton Co.

French Flint
Paper Makers Importing Co.

Frit
Ceramic Color & Chemical Mfg. Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.
Titanium Alloy Mfg. Co.

Furnace
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

G

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld & Co., B. F.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.
Titanium Alloy Mfg. Co.

Glaze Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Gold
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Grinding Wheels
Norton Co. (*Alundum Crystolon*)

H

Hearths
Carborundum Co.
(*Carbofrax* heat treating)
Norton Co. (*Crystolon*)

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

I

Iron (Enameling)
American Rolling Mill Co.

K

Kaolin
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Kilns (China, Decorating)
Drakenfeld & Co., B. F.

Kryolith
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

L

Leeds (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.

Linings (Furnace Refractory, Block Refractory Plate, Brick and Tile)
Carborundum Co.
Norton Co.

M

Magnesia (Sintered, Calcined)
The Exolon Co.
Norton Co.

Magnesite
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Manganese
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Metals (Porcelain Enameling)
American Rolling Mill Co.

Minerals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Muffles (Furnace)
Ferro Enamel Corp.
Carborundum Co. (*Carbofrax*)
Norton Co.

Mullite (Artificial)
The Exolon Co.

Muriatic Acid
Pennsylvania Salt Mfg. Co.

N

Nitrates (Cobalt, Sodium)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

O

Opacifiers
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Oxides
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Ferro Enamel Corp.
Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

P

Pins
Potters Supply Co.

Porcelain Enameling Service (Practical)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.
Titanium Alloy Mfg. Co.

Porcelain Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Potash (Carbonate)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
McDanel Refractory Porcelain Co.

R

Refractories
Carborundum Co.
The Exolon Co.
Norton Co.

Refractory Materials
Carborundum Co.
The Exolon Co.
Norton Co.
Titanium Alloy Mfg. Co.

Rutile
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

S

Saggers
Carborundum Co.
Norton Co.
Potters Supply Co.

Selenite of Sodium
Drakenfeld & Co., B. F.
The Vitro Mfg. Co.

Selenium
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The Roessler & Hasslacher Chemical Co.
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American Rolling Mill Co.

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Silicate of Soda
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Philadelphia Quartz Co.
The Vitro Mfg. Co.

Silicon Carbide
The Exolon Co.
Norton Co.

Silicon Carbide Firesand
The Exolon Co.

Sillimanite (Synthetic)
The Exolon Co.

Slabs (Furnace)
Carborundum Co.
Norton Co.

Smelters
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

Soda Ash
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The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sodium Antimonate
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sodium Fluoride
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Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
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The Vitro Mfg. Co.

Spurs
Potters Supply Co.

Stilts
Potters Supply Co.

Sulphuric Acid
Drakenfeld & Co., B. F.
Pennsylvania Salt Mfg. Co.

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Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.

Tanks (Pickle)
Ferro Enamel Corp.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Norton Co.

Tile (Wall)
Ferro Enamel Corp.
Paper Makers Importing Co.

Tin Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Titanium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Vitro Mfg. Co.
Titanium Alloy Mfg. Co.

Titanium Oxide
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.
Titanium Alloy Mfg. Co.

Tubes (Insulating)
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
McDanel Refractory Porcelain Co.
Norton Co.

W

Wet Enamel
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Whiting
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.

Z

Zirconia
Ceramic Color & Chemical Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

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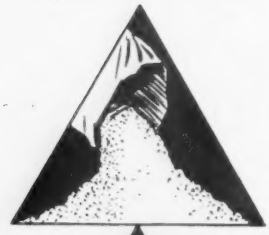

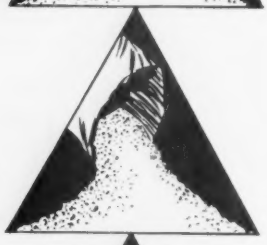

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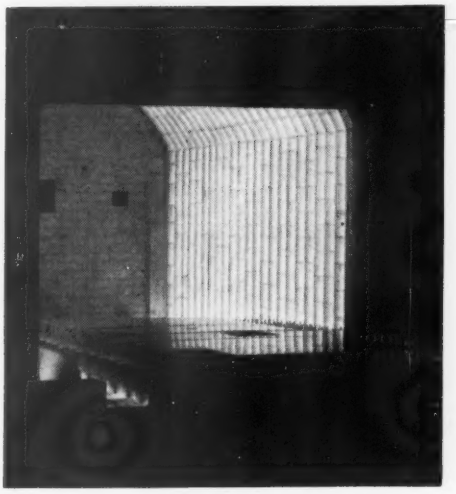

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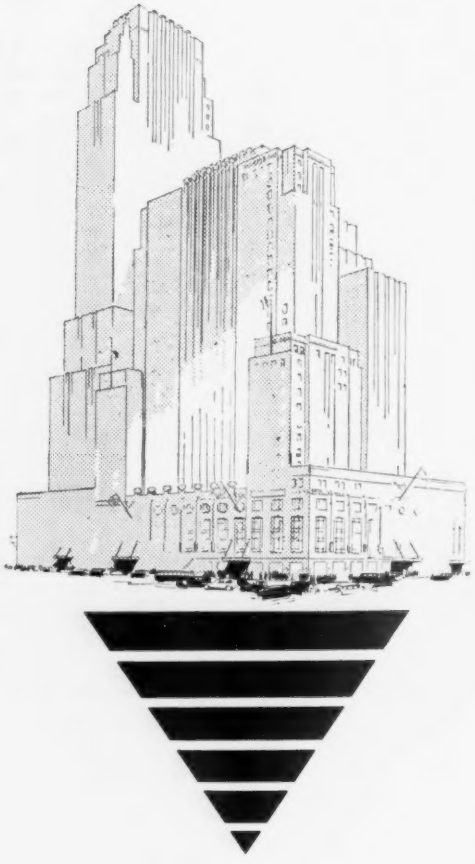

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TUESDAY NIGHT—Fellow lecture at 8 P. M. by Arthur L. Day.

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